MAY, 1930

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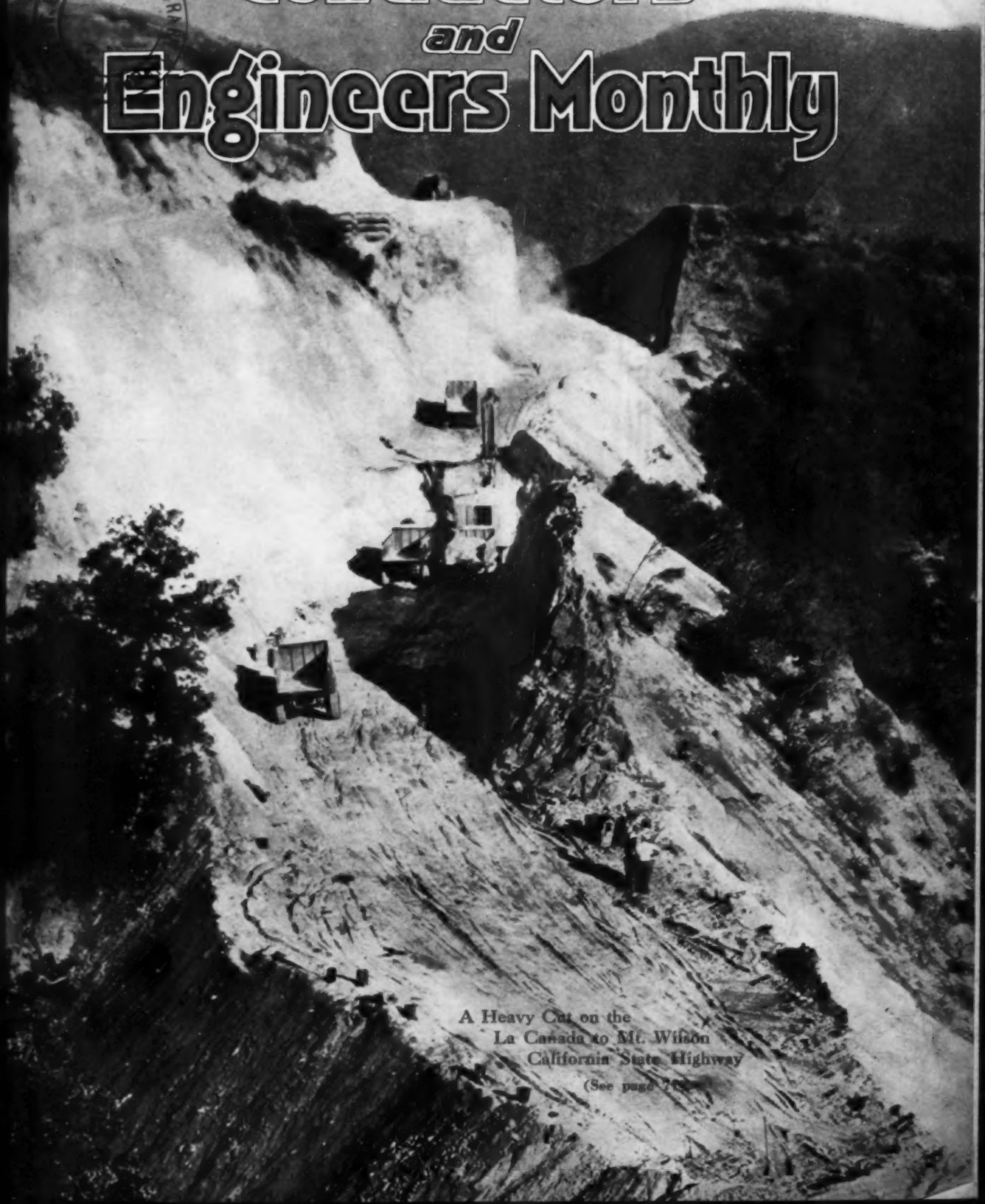
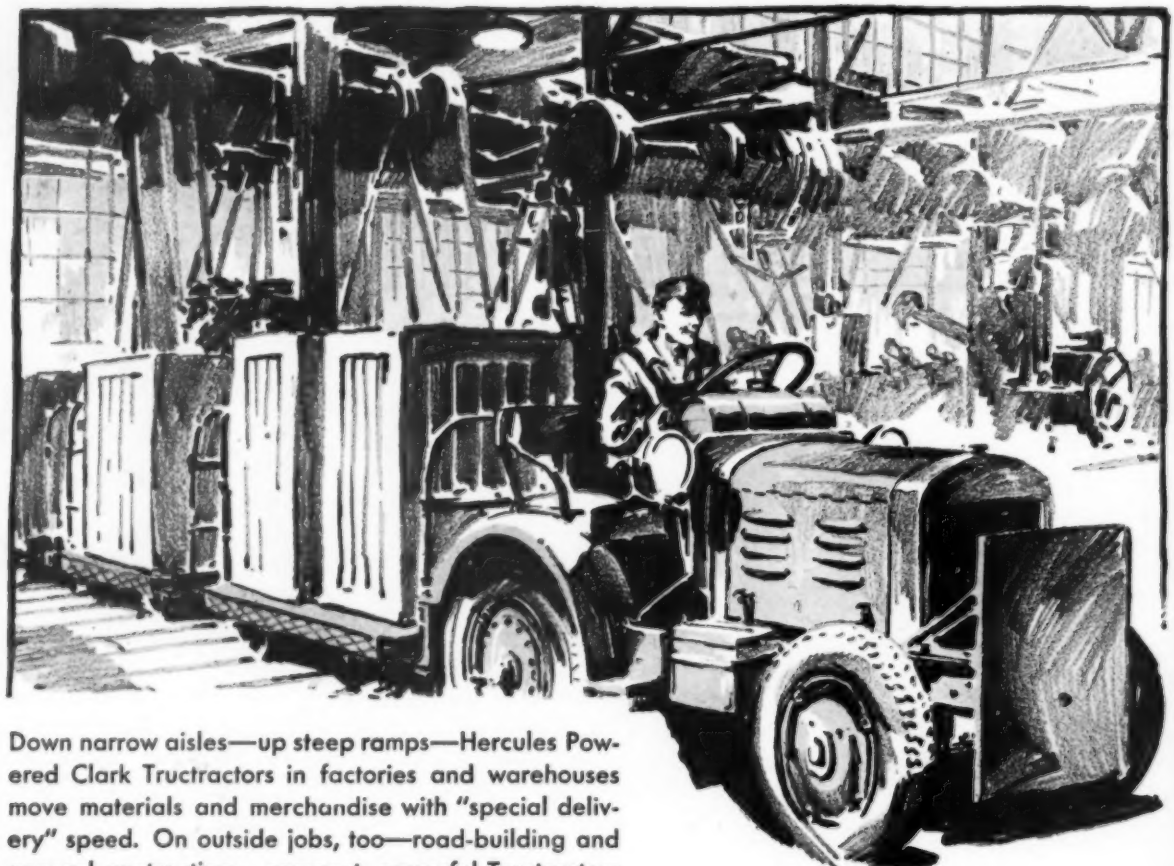


A Heavy Cut on the
La Canada to Mt. Wilson
California State Highway

(See page 70)

Cutting Material Handling Costs with Hercules-Powered Tractors



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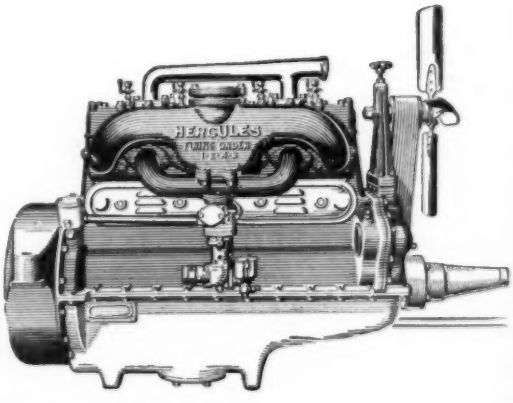

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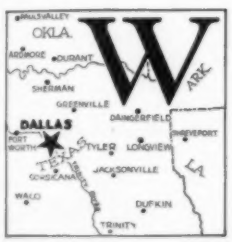
West Coast Branch: Los Angeles, Cal. - Mid-Continent Branch: Tulsa, Okla.

HERCULES ENGINES

Vol. XX No. 5 CONTRACTORS AND ENGINEERS MONTHLY, MAY, 1930 Price, 25 Cents; $1 a Year
Entered as second-class matter, April 16, 1923, at the Post Office at New York, N. Y., under Act of March 3, 1879. Issued Monthly by The Buttenheim-Dix Publishing Corp., 443 Fourth Ave., New York. The Buttenheim-Dix Publishing Corp., 443 Fourth Ave., New York.
Printed in U. S. A.

Raising the Rock Island at Dallas to Meet New Levee Grades

Gas Shovels and Industrial Railways Handle Over 300,000 Cubic Yards of Dirt



WHEN the Dallas City and County Levee Improvement District No. 10 decided to construct new levees along the Elm Fork of Trinity River, it necessitated a great deal of additional work on the part of various railroads and the State Highway Department to carry tracks and highways over the new levees without excessive grades. The Chicago, Rock Island & Pacific Railway is now engaged in elevating its tracks at this point, a project involving new fills containing over 300,000 cubic yards of material, as well as new trestles, bridges and culverts.

The Rock Island contracted for the new fills with Roberts Brothers, Chicago contractors, who moved in on the work January 1, 1930, organized their construction forces, installed their equipment and were ready to move dirt by January 15. The major equipment on this job consisted of five 18-ton Davenport steam locomotives, more than 50 Western 4-yard dump cars, two Nordberg track shifters, two Lorain 75 1¼-yard gasoline shovels, together with various smaller tools, always necessary on such a project.

Industrial Haulage

The narrow gage tracks were laid to two borrow pits and strung out over the job with four trains of 12 cars each ready to take the dirt away from the shovels and haul it to the fills. The spot chosen for the borrow pit is on the opposite side of the new levee to the fill, as the soil characteristic at that point is most desirable. The material is about 50 per cent compact clay interspersed with sand pockets. These borrow pits are each between 1,300 and 1,400 feet long and are approximately 9 feet deep, running somewhat deeper at the extreme west end. The distance from the borrow pit to the fill is approximately one mile and it is necessary for the trains to cross over the new levee at a 2½ to 3 per cent grade. This usually requires the use of a pusher.

Four trains are used, two for each shovel. The trains consist of twelve 4-yard Western dump cars which are loaded to capacity. While the shovels are idle a considerable portion of the time, it was not considered advisable to use additional transportation because of the congested bottleneck at the gap in the levee where serious tie ups might occur with added industrial trains.

When the illustrations were taken on March 17, the contractor had already moved approximately 150,000 cubic yards or about 50 per cent of the contract. The two shovels are loading about 4,000 cubic yards per day working two 11-hour shifts each. This is an unusually good yardage, in spite of the many delays between trains and the contractor has stated that these 1¼-yard shovels are moving as much dirt as he had been able to move on some projects with shovels of 1¾ and 2-yard capacities. Considerable friendly competition has developed between the day and night shifts on the shovels and between the two shovels, which has added zest to the job, helped to speed it up and made the work generally more interesting to everybody involved.

Night Illumination

One reason for the progress on this job is the fact that it is provided with an ample lighting system for night work. Independent lighting plants are provided on the shovels which give plenty of illumination at the

borrow pits. Lights are also strung out over the fill in sufficient numbers to eliminate the common disadvantages of night operation and they seem to be moving about as much material on the night shift as they do on the day shift.

When this project is completed the Rock Island tracks will have been raised approximately 21 feet above the original grade, a sufficient height to put them in the "high and dry" no matter what kind of a rampage this little river may have. The Trinity River and its branches are most innocent looking streams during dry weather, but during the rainy season they sometimes become mighty tough propositions. At times the Trinity has overflowed its banks in Dallas County to a total width of more than a mile.

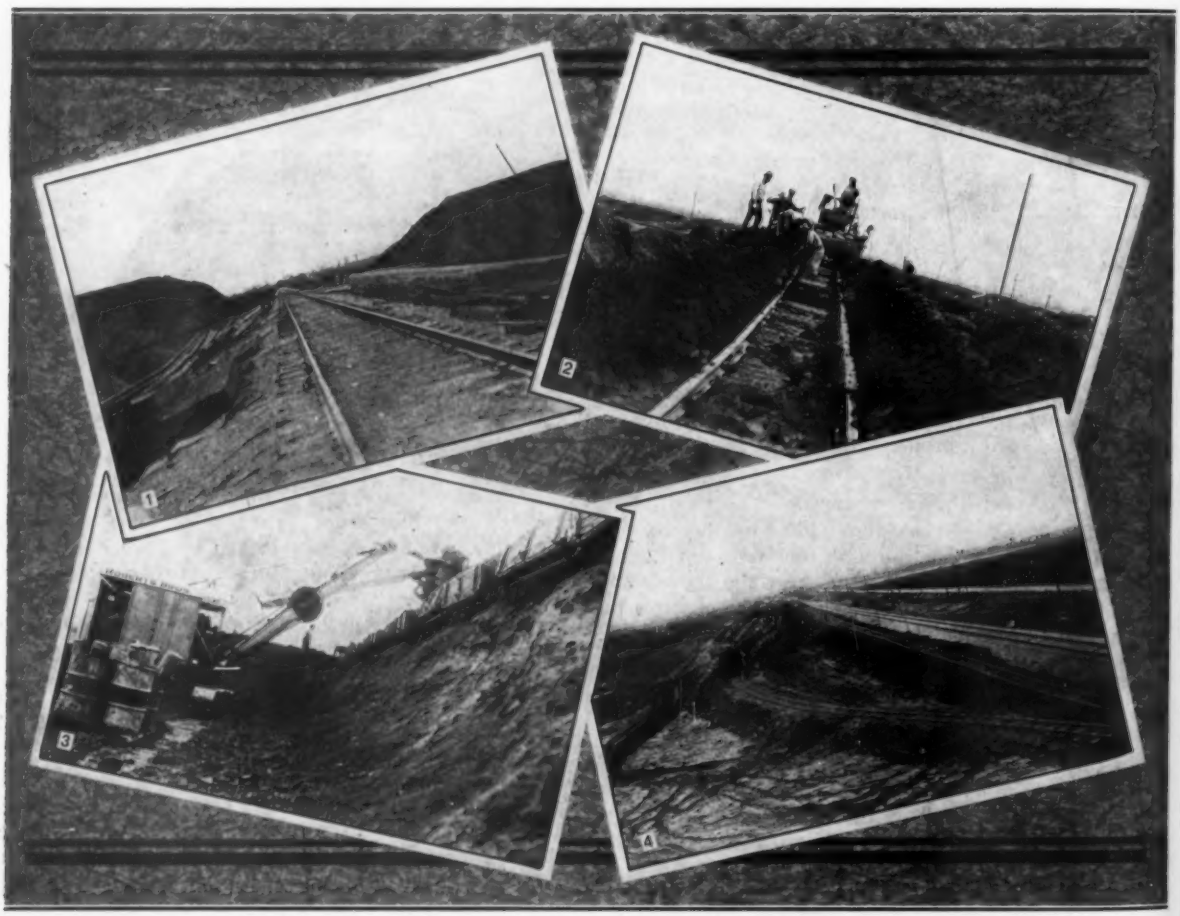
PERSONNEL

G. W. Roberts of Roberts Bros., contractors on this project, spends most of his time on the job. Jim Stanley is Superintendent for Roberts Brothers and the Rock Island is represented by C. M. Webb, Engineer in charge.

Fewer Accidents in Building Industries in Metropolitan New York in 1929

ACCIDENTS in the building construction industry in the New York Metropolitan District during 1929 showed a distinct falling off in frequency and severity percentages from those occurring in 1928, according to a survey conducted by the Building Trades Employers Association through its Committee on Accident Prevention. The 298 firms which reported employed 18,838 men who worked 39,962,397 man-hours. The frequency rate was 42.36 which compared favorably with the rate in 1928 which was 49.67, being a drop of 15 per cent. The severity rate, that is, the number of days lost per man-hours worked, was 3.49 as against 5.74 in 1928, a most satisfactory drop of 40 per cent.

In 22 different trade groups, 119 firms with 2,336 employees working 4,720,217 man-hours, completed the year without a lost-time accident. In 16 different trade groups, 156 firms with 26,000 employees worked 53,119,133 man-hours and showed a combined frequency rate for 1928 and 1929 of 50.65 and a severity rate of 5.60. The frequency rate for 1929 was 49.71 as against 51.56 for the previous year, this being a drop of 4 per cent. The severity rate last year was 4.78 as against 6.38 for 1928, a drop of 25 per cent. Thirty-three firms with 1,205 employees, working 2,337,819 man-hours completed both years without a lost time accident.



PUSHING THE BIG ROCK ISLAND FILL TO CARRY THE TRACKS OVER THE NEW DALLAS LEVEE

1. The new levee seen on either side of the main line track is 20 feet above the track grade. Note the narrow gage track at the left of the main line and the fill beyond the gap. 2. Two crews are kept busy with this Nordberg track shifter raising the dump track and getting ready for the next trainload. 3. This material is about 50 per cent hard clay and tough digging. Note the skid loaded with grease, oil and fuel, which is towed behind the shovel. 4. A general view of the fill looking east from the top of the levee. One of the 12-car trains is dumping on the fill. The highway is seen at the extreme right, and then the old main line which is to be raised.

Four Derricks Work As One

to Bend - Lift - Float *and* Lay Battery of Pipes *in* Spuyten Duyvil

Another Well-Planned Maneuver by the "Black Horse" Fleet

MASTERLY maneuvering of a huge "one-piece fleet" 540 feet long, composed of four of the largest floating derricks in the world, lashed rigidly together, and careful manipulating of the derrick falls, winches and drums in accordance with a prearranged system of signals, enabled the Merritt-Chapman & Scott Corp., New York, to complete, without incident, the laying of a 620-foot power line crossing under the Harlem Ship Canal at Spuyten Duyvil, N. Y., for the New York Central Railroad. The work was done to furnish a power line for the West Side Improvement and the electrification of the 30th Street lines of the New York Central. Two months of preparatory work was necessary in assembling the battery of pipes and then on Saturday morning, March 1, the fleet of four derricks, including the Monarch, the largest floating derrick in the world, the Colossus, the Capitol and the Century, as well as the Champion, a general utility derrick and service vessel, and the swarm of tugs, launches and messenger boats, moved in.

Preparing the Nest of Pipes

The first step in preparation for this big piece of specialized construction was to install a temporary assembly dock, parallel with the north shore of the Harlem River and 300 feet east of the proposed crossing. On this dock were assembled twenty-eight lines of extra heavy wrought iron pipe 4 inches in diameter, and eight lines 3½ inches in diameter, arranged in nine vertical rows and four horizontal rows 9 inches apart center to center. The individual pipes were joined with screw couplings to make up the 36 lines of pipe, each approximately 620 feet long. Each coupling was oxy-acetylene welded at each end. The pipes were spaced by wooden collars approximately 10 feet apart and on these collars were mounted the bridles by means of which the entire length of pipe was lifted. Each individual pipe was then tested under a pressure of 90 pounds to the square inch to be sure that there were no leaks anywhere.

After the pipes were connected and the pressure test applied, they were given a course of treatment designed to prevent any possibility of corrosion or electrolysis. First, they were given two coats of bitumastic enamel, such as was used in the locks of the Panama Canal, applied cold with a brush.

The nest of pipes was made up flat on the dock and not preshaped to fit the contour of the bottom of the ship canal. Inasmuch as this power line crossing was laid in navigable water, it was placed in a trench in accordance with government regulations and backfilled. The trench was dug with a dipper dredge to a definite contour in stiff clay so that the pipes when laid and backfilled were 6 to 15 feet below the bottom of the dredged channel.

Painting the Pipes

The pipes then were painted with an additional two coats of bitumastic enamel to prevent corrosion, this

A Moment Before the 620-Foot Bank of Pipe Was Lifted Clear of the Temporary Dock

time applied hot. Two men passed a strip of canvas 30 inches wide under a pipe supported on blocks, holding the two ends close together so that nearly 180 degrees of circumference of the pipe was enveloped. An assistant with a can of scalding bitumastic poured the stuff on the section of pipe within the canvas. Then the two canvasmen sawed the ends of their cloth up and down, holding it free from the lower side of the pipe but close enough to spread the bitumastic on the pipe. The consistency of the enamel was such that more stuck to the upper side of the pipe than the men were able to apply to the lower half.

When one section was satisfactorily coated, the canvasmen moved along 30 inches, the pipe was blocked up free of the yokes and the process repeated. After the pipes were assembled they were gone over thoroughly with hot enamel to cover any possible uncoated spots. As a precaution against the possibility of damage to the enamel by chafing in the wooden yokes and to promote easy slippage in bending, each and every pipe was wrapped in a strip of wood veneer at each yoke.

To prevent corrosion on the inside, each pipe was filled with a refined mineral oil after which the ends were sealed. To fill them all, 12,000 gallons of oil, or two tank car loads, were required. This could not be done until the bank of pipes had been laid in the river. To make sure that the pipes were thoroughly watertight, a wooden mandrel ¼-inch less in diameter than the pipes was drawn through pipes selected at random. As the mandrel came through without any traces of moisture, it was apparent that the pipes had no leaks.

Preparation for the Big Lift

Inasmuch as the work was carried on in very cold weather, there was some question as to whether the bitumastic enamel would stand the bending without cracking. In order to prevent any possibility of this the pipes were covered with canvas tarpaulins and low pressure steam flowed through for several hours before the pipe was picked up. This softened the enamel so that, after bending, the inspectors were unable to find so much as hair cracks in the enamel, though they actually used magnifying glasses.

The Big Lift

It was a big problem, of course, to lift the great rigid length of this nest of 36 pipes, 620 feet long and weighing 186 tons, to float it to place and to lower it through the 20 feet of water into the trench 15 feet deep. But a still bigger problem was to bend it to accurate contour as a part of the process of lifting. To accomplish this, the four floating derricks, Monarch, Colossus, Capitol and Century, were lashed rigidly together with wire cable and protected with heavy tenders between each derrick, thus making it possible to maneuver the four as a single unit.

For the big lift, a spreader (a steel cross-beam or horizontal box girder) was hung from the main fall of each derrick. The two center derricks, the Colossus and the Capitol, had 95 and 100-foot spreaders, respectively. On the Century, which was at the right end of the "one-piece fleet," the spreader was 100 feet long with a 20-foot trussed extension. The Monarch, at the

other end, had a 100-foot spreader with a 30-foot extension, also trussed at the connection.

Each of these spreaders carried a series of graduated-length lifting cables or "pennants" (as any suspended wires are called in the vernacular of the derrick fleet), each pennant designed to exert its pull at the exact right moment in the cycle of bending. There was one pennant to each separator on the nest of pipes, connected to it through a bridle. Thus, as the pull was exerted on the matched measured pennants, the pipe as lifted took the final contour decided upon—the ends of the big duct line taking a modified parabolic curve, with the center flat. Side falls controlled the alignment of the pipe with respect to the derricks.

Mooring lines were run from drums and winches on all the derricks and were fanned out to anchors set by the Champion as well as to piling of the New York Central Bridge, to dolphins, and to dead men on shore. The perfect control and extreme accuracy with which the rigidly-lashed derrick fleet maneuvered was due to the fact that it was not moved by tugs but wholly by manipulation of the derrick drums and winches. At certain times during the operation, the leeway at the ends of the pipes was reduced almost to inches.

SEQUENCE

The first move was to pre-form the bends in the nested pipes to the contour of the prepared trench. This, of course, was done by the end derricks and, in order that attention might be concentrated on this crucial operation, only one end was bent at a time. First, the Century bent its pipe-end, then the Monarch got into action. Bending was completed on Saturday night, and the entire assembly hoisted clear of the dock, resting in the slings until next morning.

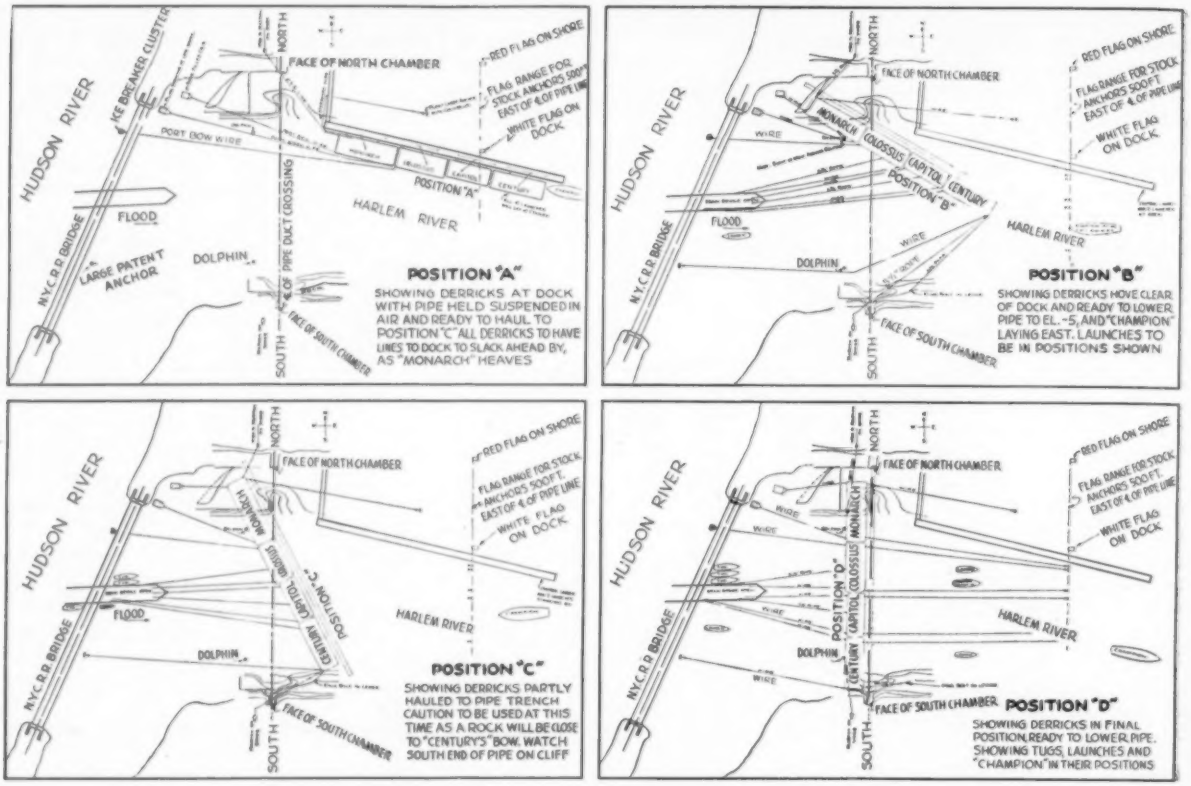
Sunday morning at six o'clock came the second maneuver. The derricks moved away from the dock and lowered the pipe bank until the horizontal section was submerged. This, of course, created considerable buoyancy and greatly reduced the load on the derricks. The fleet then was moved into position over the trench, by manipulation of the mooring lines, with the Monarch on the north side of the river. Great care in maneuvering was required because of shallow water over a rock ledge on the south side.

The pipe bank was slowly lowered, under direction of the control launch out in front, using large number cards and ordinary police whistles and flags as signals. The lowering was done by 12-inch stages, with the four derricks slacking off at the same moment. In order that the control officer as well as the captains of the derricks might be able to check the position of the pipes at all times during its lowering, gages were suspended from the spreaders of the derrick. The readings on these gages had to conform at all times with the numbered card in view on the control boat. As the curved ends submerged, one of the most critical factors came into play, for the center of gravity of the line continually shifted, making it necessary to exercise extreme care in handling the booms to prevent bending or buckling of the nested pipes. When the pipes finally reached the bottom of their trench, divers went down to loose the pennants from the bridles and to "walk" the length of the pipes for a final check. The iron soles of their diving shoes were carefully covered with gunny-sacking to prevent abrasion of the enamel covering.

Progress of the work was hampered by the 3-knot tide and the constantly-shifting currents which prevail in the Harlem River. To further complicate matters, a high wind blew throughout the operation, exerting a substantial force against the bank of pipes and the derricks, which offered a considerable sail area. Every movement was carefully calculated, however, so that full advantage could be taken of the meagre 40 minutes of slack water and the pipes were actually lowered to the bed during that brief period.

The actual moving started at 6 o'clock Sunday morning, March 2, and the pipe was landed in position at noon. Before sundown, the entire fleet had dispersed and was on its way to the next job.

Submerging the Center Flat Section, Before Maneuvering, to Decrease the Load on the Derricks


HUDSON RIVER
ICE BREAKER CLUSTER
NORTH
FACE OF NORTH CHAMBER
RED FLAG ON SHORE
FLAG RANGE FOR STOCK ANCHORS 500FT EAST OF ℄ OF PIPE LINE
WHITE FLAG ON DOCK
PORT BOW WIDE
POSITION "A"
HARLEM RIVER
FLOOD
N.Y.C.R.R. BRIDGE
LARGE PATENT ANCHOR
DOLPHIN
℄ OF PIPE DUCT CROSSING
SOUTH
FACE OF SOUTH CHAMBER
POSITION "A"
SHOWING DERRICKS AT DOCK WITH PIPE HELD SUSPENDED IN AIR AND READY TO HAUL TO POSITION "C" ALL DERRICKS TO HAVE LINES TO DOCK TO SLACK AHEAD BY, AS "MONARCH" HEAVES
WIRE
MONARCH
COLOSSUS
CAPITOL
CENTURY
POSITION "B"
POSITION "B"
SHOWING DERRICKS MOVE CLEAR OF DOCK AND READY TO LOWER PIPE TO EL. -5, AND "CHAMPION" LAYING EAST. LAUNCHES TO BE IN POSITIONS SHOWN
POSITION "C"
SHOWING DERRICKS PARTLY HAULED TO PIPE TRENCH CAUTION TO BE USED AT THIS TIME AS A ROCK WILL BE CLOSE TO "CENTURY'S" BOW. WATCH SOUTH END OF PIPE ON CLIFF
POSITION "D"
SHOWING DERRICKS IN FINAL POSITION READY TO LOWER PIPE. SHOWING TUGS, LAUNCHES AND "CHAMPION" IN THEIR POSITIONS

Sequence of Maneuvers of the Four Giant Derricks and Nest of Pipes

The Final Stage

The final stage consisted in covering the pipes in the trench first with 2 feet of sand on which 2 feet of gravel was spread, following which the trench was filled to the level of the river bottom. Electrical cables, 2¾ inches in diameter, will be drawn through the 4-inch pipes, leaving a protecting film of oil around them. They will then be connected with the ducts on either side of the river. These connections will be made in concrete splicing chambers, of which there are three on each side of the river 5 x 14 feet and 8 feet deep.

Personnel

This interesting piece of underwater work was done under the direction of F. B. Freeman, Chief Engineer, of the New York Central Railroad. Assistant Engineer

SINKING THE BANK OF PIPE AT FINAL LOCATION

Note the railroad bridge at the right and the New Jersey tower of the Hudson River Bridge in the distance

C. J. Klueh carried on the research and experiments and design of the line. The P. T. Cox Contracting Co., New York City, had the general contract for the entire work which includes subsurface duct lines north and south of the pipe crossing. The work described above was done by the Merritt-Chapman & Scott Corp., New York City, under the direction of George Burrows, Assistant Construction Manager, with Captain George Tooker, Superintendent of the Derrick Department, in direct command of the hoisting operations and fleet maneuvers. A. Siecke, Engineer for Merritt-Chapman & Scott Corp., designed the extensive special gear and equipment, which was built at the Staten Island Shops of the corporation.

A 163-Ton Shield Moved By Trailer Six Blocks *in* 45 Minutes

By

John E. Davis

Gerosa Haulage & Warehouse Corp.
Hauling Contractors
Bronx, New York

THE Cornell Contracting Co., of New York City, has a contract for subway work in Brooklyn. When one section was finished, it became necessary to move one of the 163-ton tunnel shields a distance of six blocks from Prospect Park Southwest to Terrace Place and Prospect Avenue. The shield is worth $40,000 and the loss while not in operation is about $1,200 a day, so it was decided that the shield would not be dissembled, but that some method of moving it as a unit would be devised.

A contract was let to the Gerosa Haulage & Warehouse Corp., Bronx, N. Y., to jack this shield 30 feet up the shaft, turn it on the street, jack it up on cribbing and then back the 65-ton eight-wheel Rogers trailer under it preparatory to its move. The actual job required 16 hours of preparation while the moving took only 46 minutes. The shield is 20 feet 6 inches in diameter and 17 feet 9 inches long. When cribbed on the trailer, it stood 25 feet high, making it necessary to remove overhead wires. The street railway tracks were closed on the route of the haul from one to five in the morning and a special city permit was required for the work.

The 163-Ton Shield Up Out of the Shaft and the 65-Ton 8-Wheel Rogers Trailer Backing Under the Cradle Preparatory to Starting the 6-Block Haul

When the shield was delivered at the second shaft, it was lowered by 12 x 12 timber cribbing in the same manner in which it was raised at the initial shaft. A similar shield is to be moved shortly from the northbound express tunnel to the starting point on the north bound local tunnel. These shields are digging tunnels which are lined with concrete block as the work proceeds.

The shield was literally lifted out of the first shaft by its bootstraps, as four of the 10-inch hydraulic jacks used for shoving the shield were removed and were used for lifting it onto the timber cribbing. The cradle on which the shaft was carried on the trailer was built

A Close-Up of the Shield Showing the Cribbing, Cradle and Interior Bracing

under the shield before the jacking process was started in the initial shaft. As shown in the illustration, the shield was well lashed to the cradle to prevent the possibility of any side-motion.

The load was hauled successfully the entire six blocks by a 10-ton Mack tractor. The trip was made without any difficulty with the exception of one break in the asphalt paving where a hole existed under the surface. It was necessary in this case to jack the entire trailer out of the hole and supply temporary planking to bridge it.

The Proposed Uniform Lien Act

THE unanimous agreement on the draft of the proposed uniform lien act which has been reached by the Standard State Mechanics' Lien Act Committee of the Department of Commerce, has been greeted with general satisfaction. The Lien Act Committee appointed in 1924 by Herbert Hoover, then Secretary of Commerce, faced a task which many in the construction industry thought impossible of accomplishment. The representatives of the various groups involved in the industry were asked, with their conflicting views and economic interests, to develop a draft of a lien law which would be equitable, practical and beneficial alike to the workman, owner, material man, general contractor, subcontractor and financial house.

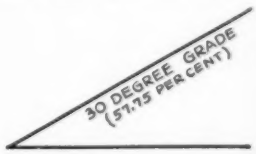
It is not surprising, according to E. J. Harding, Assistant General Manager of the Associated General Contractors of America, that 5 years were required to arrive at the unanimous agreement. That such agreement was reached at all was an encouraging indication that the construction industry is developing in its thinking to that stage where a genuine industrial consciousness can direct it.

The proposed uniform law now backed with the unanimous approval of the Department of Commerce committee will be required to secure the approval of the Conference of Commissioners on Uniform Laws before being presented to the various state legislatures as a measure to replace existing statutes. The divergence of lien law statutes now existing and the inequity of many of the provisions in such laws has long been a sore spot in construction. Owners have been inequitably held to dual payment in many states under existing statutes, unsound credit conditions have been fostered and many unethical practices have developed because of the patchwork legislation concerning lien rights.

The Relation Between Per Cent and Degrees in Grades

GRADES in excavation work are usually designated by per cents which means the number of feet rise in 100 feet. There is a tendency sometimes to confuse the per cent grade with the degree of a grade or to associate per cent and degree as one and the same thing. The diagrams above clearly illustrate the difference between the two.

The left-hand diagram shows a shovel on a 30 per cent grade which makes an angle of about 16.7 degrees with the horizontal. This is the grade that a good crawler truck mounting should negotiate at one-half mile per hour in low gear. Note the right-hand diagram. This shows a machine on a grade which makes an angle of 30 degrees which is actually 57.75



per cent grade and beyond the ability of a crawler truck under normal conditions. The following table shows the relation between per cent, proportion, feet per mile and degrees:

Per Cent	Proportion	Feet Per Mile	Degrees
0.25	3 inches in 100 feet	13.2	0.15
0.50	6 inches in 100 feet	26.4	0.30
1.00	1 foot in 100 feet	52.8	0.60
1.75	1 foot 9 inches in 100 feet	92.4	1.00
2	2 feet in 100 feet	105.6	1.25
3	3 feet in 100 feet	158.4	1.75
4	4 feet in 100 feet	211.2	2.30
5	5 feet in 100 feet	264.0	2.90
6	6 feet in 100 feet	316.8	3.45
7	7 feet in 100 feet	369.6	4.00
8	8 feet in 100 feet	422.4	4.75
9	9 feet in 100 feet	475.2	5.15
10	10 feet in 100 feet	528	5.75
15	15 feet in 100 feet	792	8.50
20	20 feet in 100 feet	1,056	11.30
30	30 feet in 100 feet	1,584	16.70
40	40 feet in 100 feet	2,112	21.80
50	50 feet in 100 feet	2,640	26.60
57.75	57 feet 9 inches in 100 feet	2,948.2	30.00
75	75 feet in 100 feet	3,960	36.90
84	84 feet in 100 feet	4,435.2	40.00
100	100 feet in 100 feet	5,280	45.00

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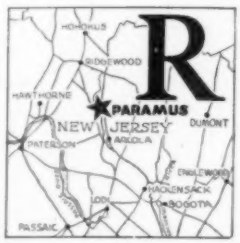
Cost Accounting

One of the most frequent requests from readers of CONTRACTORS AND ENGINEERS MONTHLY *is for more data on costs, cost keeping and accounting. The June issue will contain an interesting article entitled "Cost Accounting for the Highway Contractor" which describes methods of recording daily distribution of material and labor cost that the contractor may note losses as they occur.*

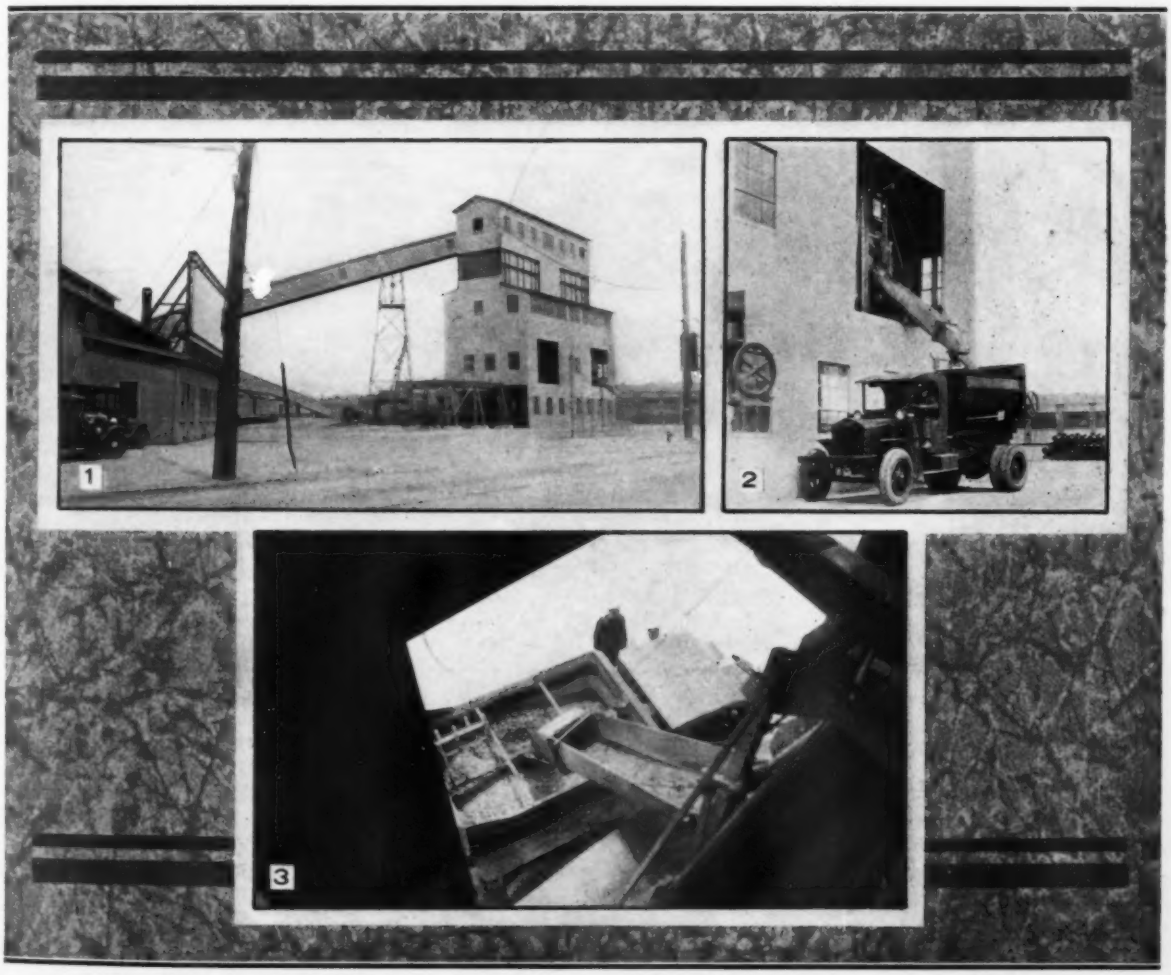
Ready-Mixed Concrete *for* Long Slim Road Job



ROUTE 2, one of New Jersey's heavily traveled thoroughfares, originally consisted of an 18-foot bituminous concrete road on a concrete foundation. This proved too narrow for the increasing traffic, so outside the concrete headers, 3-foot strips of asphalt concrete were added. During the early spring of 1930 the New Jersey Bell Telephone Co. placed its telephone cables in conduits along a 4½-mile stretch of this road in Paramus, necessarily ripping up the 3-foot asphaltic concrete widening strip. Arrangements were made between the telephone company and Bergen County highway officials that the telephone company should replace the widening strip with 5 inches of concrete, on top of which a 2-inch asphalt course is to be laid to take out part of the present crown of the road.

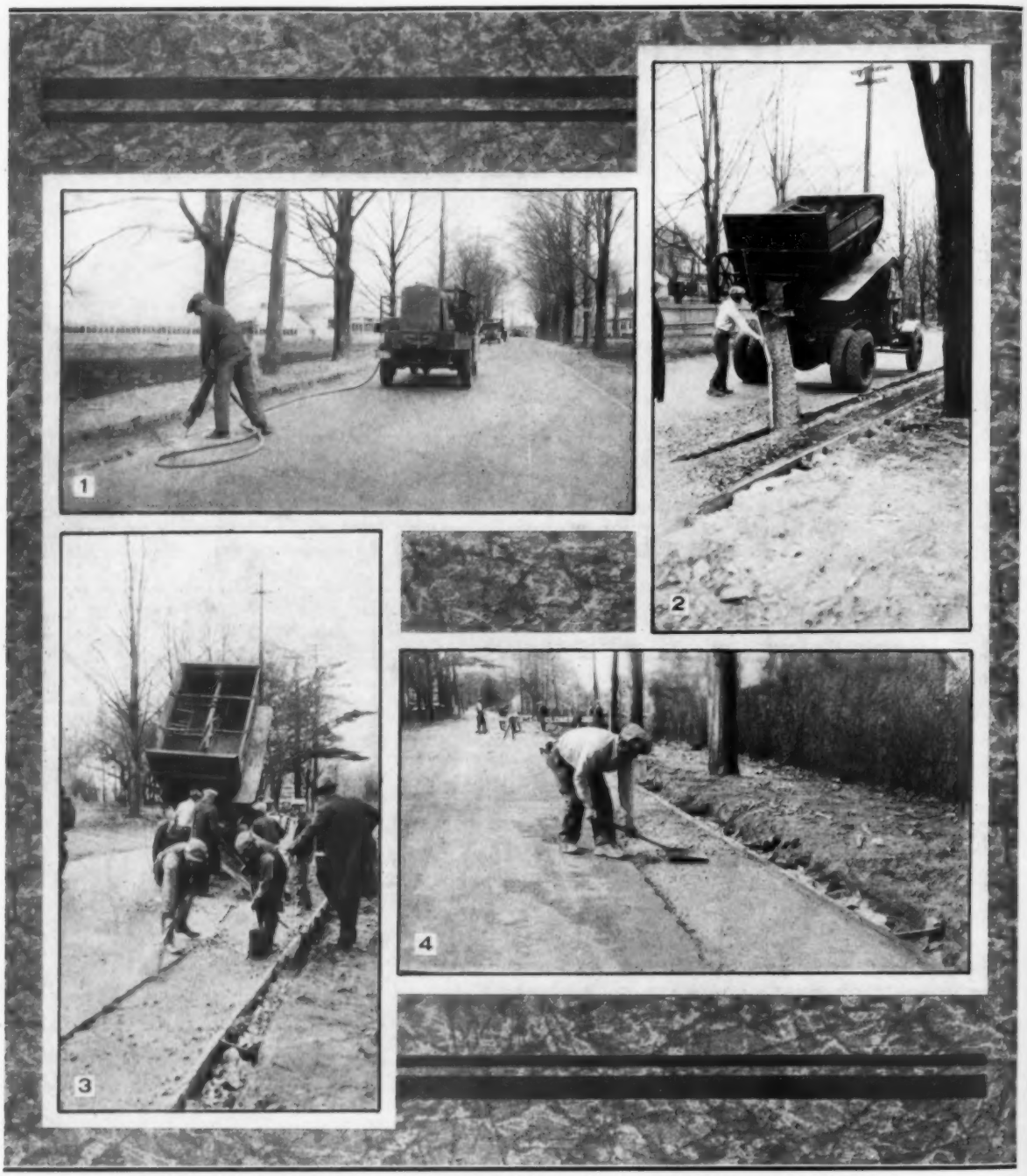
Preparing the Strip

In breaking out the concrete header which was not removed by the telephone company in laying its conduits, the contractor, George M. Brewster & Sons, Bogota, N. J., used an Ingersoll-Rand portable compressor mounted on a Model AA Ford truck. This compressor has an I-R air motor mounted at the side



THE READY-MIXED CONCRETE PLANT OF GEORGE M. BREWSTER & CO., AT BOGOTA, N. J.

1. *The complete plant showing the aggregate conveyor at the left.* 2. *Loading one of the Blaw-Knox agitator trucks from the 3-yard Ransome mixer.* 3. *Loading the truck as seen from the mixer operator's platform.*



PREPARING THE TRENCH AND DEPOSITING THE READY-MIXED CONCRETE

1. *Breaking out the old concrete header with a jackhammer.* 2. *Placing the concrete from the truck via an extension coal chute.* 3. *Spading the concrete into place.* 4. *Finishing the concrete with the back of a spade.*

which runs a centrifugal pump with a 3-inch suction and 2-inch discharge, which can be used for unwatering trenches and other pumping uses. The portable compressor normally operates two jackhammers, but three can be tied up to it, as it is very infrequently that all three hammers will be operating at the same time.

AGITATOR TRUCKS USED

The contractor handled the job in a most effective manner through the use of ready-mixed concrete delivered along the project in Blaw-Knox agitator trucks. The central mix plant, which will be described in a later issue of CONTRACTORS AND ENGINEERS MONTHLY, is located in Bogota, N. J., 9 miles from the near end of the 4½-mile widening job. A fleet which varies from 6 to 9 Blaw-Knox agitator trucks was assigned to the hauling. The trucks started hauling from the plant at 6 A. M., carrying 3-yard batches of 1:3:5 concrete which had been mixed three minutes at the plant in a

(*Continued on page 76*)

The Present and Future of Diesel Engines *for Construction Equipment*

CONTRACTORS, equipment manufacturers and even diesel engine manufacturers have sought information from CONTRACTORS AND ENGINEERS MONTHLY during the past six months as to the extent to which diesel engines are used at present on construction equipment, comparative costs and, above all, the future of this prime mover which operates with such low fuel costs. This interest has undoubtedly been stimulated very recently by the publicity given a new light-weight diesel developed for airplanes and the announcement that an innocent appearing Model T Ford has been plying its way to and fro between an air field and a motor factory under technical guard, lest the identity of its diesel motor be prematurely revealed.

This discussion is based on the prompt and complete responses sent to us by those who have had experience in this field. Some are distinctly enthusiastic, others cautious, but the quotations give you the picture with its varying shades of agreement.

OPTIMISM PREVAILS

The chief engineer of a prominent company manufacturing a line of shovels, cranes, clamshells and draglines states:

"We have gone into this subject rather deeply in the last two years and have done quite a little research in studying the application and the results as compared with those obtained with a gasoline engine.

"It would seem that the high speed, four-cycle, multiple-cylinder diesel engine which has been developed in the last few years is more adaptable to shovels and other heavy mobile machinery than the earlier two-cycle engines of low speed. The high speed engines can be governed to better advantage and in general the method of transmitting the power from the engine to the machinery would not vary from that employed with the gasoline engine. We have quite a few diesel installations in various sections of the country, mostly where the work is isolated or where it is of such magnitude that it would justify depreciating the equipment over a period of time to help compensate for the additional first cost due to the diesel engine.

"Our observation has been that diesel engines in this class of service operating on low grade fuel ranging from 26 to 38 degrees Beaume have a fuel cost about one-quarter of what it would be with the use of gasoline. In addition to the low fuel cost, there is a distinct advantage possessed by the diesel engine over the gasoline engine in this class of service due to its lugging ability. In other words, it more approximates the performance of a steam engine and, as the speed is pulled down by an exceptionally hard resistance, the torque builds up in proportion.

"In our estimation it will be quite some time before the diesel-equipped shovel or crane is accepted or purchased by contractors for use in general contract work. This is partially due to inexperience with diesel engines and also to the fact that the increased cost of a diesel-equipped job under present conditions is about 25 per cent over the cost of a gasoline-equipped machine. This latter factor will, of course, decrease as production of diesel engines increases and, in due time, it is likely that a satisfactory diesel engine can be purchased at approximately the same price per pound as the gasoline engine.

"At the present rate of increased cost and considering that the machines are working 300 days per year, it would require about two years to pay off the difference due to the saving of fuel. This, of course, is not interesting to the ordinary contractor, but only interests the purchaser where the machine is going to work over a long period of years, or, as stated above, in isolated locations where fuel oil is cheap and transportation, particularly at certain seasons of the year, difficult and expensive.

"With the modern diesel engine there is very little to get out of order or require expert attention. In fact, there is practically nothing aside from the pump and the nozzle and so long as these are cleaned frequently there should be no extra attention needed."

Between December 10, 1929, and January 10, 1930, Exclusive of Sundays, But Working Day and Night, This Dragline Moved 40,000 Yards at a Total Fuel Cost of Only $75.00. The Distillate Cost Was Only 8.5 Cents Per Gallon Delivered at the Shovel.

A manufacturer of large diesel engines states:

"We do not build any diesel engines smaller than 600 horsepower in size and we have no competition whatsoever with gasoline engines with a product such as this. It seems as though the small high speed diesel engine is quite reliable and,

from all reports, has given excellent service."

A large corporation manufacturing a variety of concrete and excavating equipment states:

"Our experience here at the factory has been entirely lacking with this type of power, so that I cannot give any first hand information. About all that I can say is that it is but a question of time when the diesel engine will be used very largely not only in connection with construction machinery, but also on motive power in general. There is a concern in Indiana which has been experimenting upon a small diesel unit and it is my understanding that their efforts are being met with considerable success."

The optimism of one manufacturer of road machinery is of particular interest.

"Ultimately, with still greater refinement in diesel engines and with lower production costs, there is no question that it will quite likely find a place in power grader service, the same as gasoline motor power is now doing."

SOME OBJECTIONS TO PRESENT DAY DIESELS

A producer of heavy duty power shovels voices the following objections to the diesel as produced and operated today:

"There are features which are not so favorable to the diesel engine and which, in time, may be eliminated. Chief among these are the following: unfamiliarity of most operators in proper care and handling of the diesel engine, whereas gas engines are very common and well understood today. Second, the difference in price is so great as to cause the average contractor to hesitate in expending the additional money for diesel-equipped machinery. This latter may be changed as the diesel engine manufacturers improve their production methods and secure sufficient quantity to permit them to cut their manufacturing costs."

A tractor manufacturer whose engineering department has been giving some attention to the possibility of the diesel engine in this field comments:

"It is quite a step from a marine engine running under ideal conditions where the air is clean, the load and speed constant and the operator at least partially trained to one where all the conditions affecting engine performance are unfavorable and we feel that much more experience in this class of work will be necessary before diesel engines will take a large place in tractors.

"Tractors of the crawler type are operated on extreme grades calling for special attention in the way of lubrication and fuel supply. Engines in this service operate continuously under extreme load variations and variations in speed which call for a fuel metering design not provided in many types of diesel engines. There are a great many problems new and unsolved in the application of diesel engines in contractors' service. The extra weight of these engines is a handicap. The extra mechanism necessary for starting diesel engines adds to the complications of the tractor."

Another manufacturer of a large line of road construction machinery discussing the status of the diesel engines as a prime mover for construction machinery, says:

"This is a matter in which we have very much interest, especially with reference to road roller design. Many European manufacturers of 10-ton rollers are already using diesel engines and we have run up against this competition in our export business, although it has not yet entered the American market.

"The objection from our standpoint to the diesel engine at the present is in its size and weight per horsepower. American users of road rollers demand machines with ample power not only for every conceivable kind of rolling, but also for the scarifying of hard surfaces. The European rollers with diesel engines are unquestionably underpowered from both of these standpoints.

"Inasmuch as the diesel engine has not yet reached the place where it is adapted, in our opinion, to use in a heavy and relatively slow moving machine like a road roller, it is obvious that it is still less adapted to use in lighter, faster moving machines like motor graders and motor sweepers.

"We hope that the time will come when our present objections to the diesel engine will be removed. In the meantime, it seems to us that it is only adapted to such things as cranes and shovels, where the questions of weight per horsepower and size are not so serious."

A manufacturer of a group of material handling machines expresses this opinion.

"We have had no real experience with diesels. So far, this is due to the extremely high price and heavy weight. We have not seen any real application for this type of machine in our equipment so far. However, we confess that we are very much interested in its development."

A manufacturer of power shovels, as well as dipper dredges, and who is using diesel engines on large dipper-type dredges, has this feeling with regard to the use of diesels on power shovels.

"Frankly, we believe there must be considerable change and improvement made in diesel engine construction and also that these engines must be made available at a substantially lower price than at present before they will be of particular interest to users of excavating equipment operating ¾-yard buckets or smaller.

"The utility and economy of the diesel engine in connection with 1-yard shovels and cranes or larger is fairly well established. Diesel engine development, however, has been typically along the line of heavy large horsepower engines and in the opinion of our engineers, the diesel is not yet thoroughly practical or economical for use on smaller capacity shovels. Shovel and crane service require that engines should be constructed with a more or less flexible power to carry over the peak load which is always present in shovel excavation service. Diesel engines with sufficient power to carry the peak load are in general a little large and heavy for use on this smaller type equipment.

"At the present comparative prices between gasoline engines and diesel engines in smaller shovels, the excess cost of the diesel engine is so great that all of the possible fuel savings for the first two or three years go to pay for the increased purchase price of the diesel engine.

"We believe that the diesel engine will some day come into its own for power purposes in connection with ¾-yard shovels and smaller, and that at the present time, the diesel engine may be considered thoroughly effective and economical principally in connection with shovels of 1 to 10-cubic yard capacities."

There seems to be little call for diesel engines for hoists and portable elevators, as a manufacturer of this type of equipment reports.

"In small engines up to 100 horsepower, we do not see how the contractor can benefit as the cost is so much more than the gasoline engine and the fuel saving and the difference in investment is such that there is hardly any saving. In other words, the investment would be so high that by figuring depreciation, etc., and new machines coming out, the contractor would not benefit by using diesel engines.

"Fuel oil is hard to get, much harder than gasoline, and if the contractor is in the country and has a portable outfit, it is difficult to secure fuel, but with gasoline engines, you can get fuel anywhere."

WHERE THE DIESEL FITS INTO THE PICTURE

The discussion above shows that in the field of the smaller construction equipment, the diesel is still wanting and as was the case with the gasoline engine only a decade ago, it is in need of considerable development to

fit it into the picture. There are, however, a number of distinct advantages in the use of diesel engines on certain types of equipment, as is shown in the quotations below.

"Our field sales force reports a greater interest than ever in the diesel type of power equipment."

This is the way one of the big manufacturers of heavy duty power shovels, cranes and draglines starts out his very emphatic and enthusiastic report:

"We have been and are after this class of business and believe that in our machine, powered by a 7 x 8½-inch diesel motor, we have a very excellent product to offer where diesel equipment will answer the purpose.

"Undoubtedly, the diesel has the advantage of low fuel cost, reduced fuel transportation difficulties and possesses the advantage of higher torques at lower speeds.

"We more or less believe that the reason the diesel has not been accepted more readily to date is one of economics because the motor undoubtedly costs a great deal more than the standard gasoline engine and, unless special job conditions or continued operation is required, there is no opportunity to work out a saving on the additional investment. We feel, however, that like most things of this nature this will correct itself as diesel motors are developed and more of them get into service and we are putting ourselves in a position to be ready to take care of diesel business whenever and wherever it appears."

A 25-Ton 8-Wheel Diesel-Equipped Locomotive Crane

A Wisconsin manufacturer of heavy duty equipment doubts his ability to predict the future of the diesel engine in construction work in replacing the present gas engine, but does feel that it has its advantages.

"There is one outstanding advantage which the diesel engine has over the gas engine and that is its ability to operate on low grade fuel, which can be purchased for approximately one-third the cost of gasoline and with this low grade fuel, it may be operated at approximately 0.5-pound fuel consumption per brake horsepower per hour, which would indicate a lower quantity of fuel consumed than with the gas engine."

One diesel engine manufacturer enthusiastically reports that five manufacturers of power shovels and excavators are using his diesel and that three manufacturers of industrial locomotives also use it. In his letter he asks if anyone ever fully explained why a diesel engine will materially increase the production of a power driven machine, answering:

"It is primarily a matter of torque at speeds less than the normal operating speed. This point may be graphically illustrated by curves which show that at 400 rpm the diesel has 700-foot-pounds torque while the gasoline engine only has 500-foot-pounds torque, the diesel gradually falling off to 500-foot-pounds torque at 1,000 rpm which is the same figure as the gasoline engine. The difference between these two curves is the reason why diesel-powered machines give as high as 15 per cent greater production."

Another diesel manufacturer says:

"The type of engines which we have supplied for contractors' equipment are of such size that gasoline engine drive has never been used and if the installation were being made 10 or 15 years ago, steam power would probably have been used. Our records of diesel operation show that these engines will have a useful life of at least 25 years and that maintenance will be a good deal lower per horsepower than on any gasoline engines so far built."

Still another producer of diesel engines has some interesting facts on costs and maintenance. He states:

"Regarding the relative initial costs of gasoline and diesel engines, we would state that we are not familiar with gasoline costs, but would advise that the cost of diesel engines in small sizes would amount to somewhere between $50 and perhaps as much as $70 per horsepower, depending upon the size of the engine. Diesel engines sell for less than $50 [per horsepower] in the larger sizes, but we feel that it would not be possible to secure a reliable diesel of the high speed type for less than this at the present day prices.

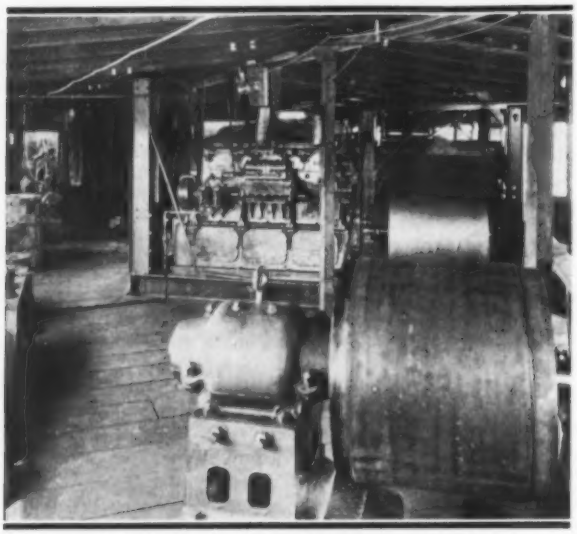
"In comparing the same horsepowers and speeds of the two types of engines, there would not be a great deal of difference in the life of the two. It is true that the diesel carries higher pressures, but, of course, it must be realized that its bearings and working parts are all made in proportion so that that would have no effect. However, comparing horsepower without regard to cylinder dimensions and rpm, it will easily be found that the gasoline motor is operated at a much higher speed than the diesel, and, of course, there is everything to be said in favor of the slower speed except possibly the added weight of the machine which makes it less handy to move.

"Upkeep costs on the diesel should perhaps be about the same per horsepower as with the gasoline engine except again where the latter is operated at much higher speeds. High speed, of course, always means added upkeep costs. The diesel engine maintains a better turning effort or torque at reduced speed than the gasoline engine and we believe this to be the one favorable feature. Of course, the main thing in favor of the diesel always is very great economy compared to the gasoline motor."

One of the fields of application of the diesel engine which has shown considerable activity during the last few years is the use of these engines on suction dredges. Although there are many thousands of horsepower in this particular class of service, there is still an element of novelty in this service, since practically all diesel-equipped dredges have been built within seven years.

"The diesel engine for suction dredge service has all of the advantages which are to be found in the use of such engines in the stationary power plant and at the same time it offers many of the advantages which are so essential in marine service. As a matter of fact, the power plant of the suction dredge is little more than a stationary power plant in a marine setting.

"The most important and fundamental advantage of the diesel engine in this service is, of course, the fuel saving. The ordinary steam equipment which is used in suction dredge service has a very low thermal efficiency. It is probable that in



A Diesel Engine and Belt Drive on a Dredge

most cases the thermal efficiency of a steam dredge is not over 5 per cent. In this respect the efficiency of the steam equipment is similar to that found in use on excavating machinery, although the suction dredge works under better load conditions than the average piece of excavating equipment. This is due to the fact that the engine drives a centrifugal pump and some form of a cutter head. The load, therefore, is not so fluctuating as is found in the dipper, orange-peel or clamshell type of dredge.

"Even under the better load conditions, however, the overall efficiency of the steam equipment is very low, due to the fact that the engines are usually of a noncondensing, slide-valve type. The diesel engine, however, will show a thermal efficiency of 32 per cent.

"Another important advantage for the diesel engine in this field of service is the elimination of the boilers since these boilers take up considerable space and with the water content add to the weight which must be carried by the hull. The diesel engine installation is so much more compact and the overall weight is less so that it is possible to get more power and more pumping capacity into the same size of hull as compared with the steam-driven equipment. Quite naturally the use of diesel engines eliminates the need for firemen and it also simplifies the problem of supplying fuel."

DIESEL-ELECTRICS FOR CONSTRUCTION PLANT

One of the fields for diesel engines which has developed very rapidly in the last few years has been the use of these prime movers in connection with construction work. On a job which involved the construction of a large dam and power house for hydro-electric development in Minnesota the contractor was using four 40-horsepower, two 50-horsepower and one 70-horsepower steam boilers, operating a scattered assortment of steam, engines, steam hoists, and steam pumps. Several gasoline engine-driven concrete mixers were also used. It was necessary to deliver coal at different points on the job. Some of it was burned and part of it was tracked into the mud. The actual operating cost of the power plant for four weeks covering 12 working days was as follows:

98 tons of coal at $7.00	$686.00
Coal handling	271.40
Engineers and firemen	432.00
Gasoline for gasoline engines	276.95
Repairs and upkeep	150.00
	$1,816.35

This equipment was replaced by the installation of a 150-horsepower diesel engine direct-connected to a 125-kva alternator. This unit furnished the current for the following electric motors:

Tower hoist	60	horsepower
Three-drum hoist	50	"
Swinger	10	"
Air compressor	15	"
Concrete mixer	20	"
Concrete mixer	20	"
Elevator	7¼	"
Hoists	3	"
Conveyor	3	"
1 pump	5	"
1 pump	30	"
1 pump	30	"
Lathe	3	"
	256¼	horsepower

The cost of operation of the new plant for two weeks or 12 days was as follows:

Two men at $4 per day	$96.00
1,200 gallons of fuel oil at 7c	84.00
	$180.00

In the January, 1929, issue of *Oil Engine Power* appeared the following:

"Three factors are mainly responsible for the superiority of the diesel and its ability to deliver yardage with astonishing economy.

"First, the diesel engine is inherently more efficient than the gasoline engine because of the higher compression and fuel combustion system with which it operates.

"Second, the economy of the diesel engine is not noticeably impaired by operation at fractional power, low speed and high torque, conditions which add greatly to the fuel consumption of the gasoline motor.

"Third, the high torque of the diesel engine enables it to keep operating steadily under heavy momentary overloads. In contrast with this the operation of a gasoline excavator must frequently be interrupted as the speed and torque of the engine falls off. The yardage output of the diesel engine is therefore practically constant, irrespective of variations in the resistance of the materials to be removed."

The following table of costs shows the comparison between the operation of two sizes of diesel-driven and gasoline engine excavators made by the same manufacturer:

Cost Comparison	1 Cu. Yd. Model 600	1¼ Cu. Yd. Model 700
Gasoline cost per 10-hour shift at 18c per gallon	35 gallons $6.30	45 gallons $8.10
Diesel fuel cost per 10-hour shift at 5c per gallon	18 gallons 0.90	22 gallons 1.10
Saving in fuel per 10-hour shift	$5.40	7.00
Increase in yardage per 10-hour shift	50 cubic yards	75 cubic yards
Credit for extra yardage at 25c per yard	$12.50	$18.75
Total credit for 10-hour shift	$17.90	$25.75
Gross total credit per year (250 shifts)	$4,475.00	$6,437.50
Deduct for extra diesel investment per year	850.00	1,000.00
Net total credit per year due to diesel power	$3,625.00	$5,437.50

DISCUSSION OF DIESELS AS APPLIED TO SPECIFIC EQUIPMENT

Already we have mentioned a large number of pieces of construction equipment which are powered with diesels. There are many others, however, on which we have data and statements of experience and opinions from various sources.

A manufacturer of heavy duty cranes and hoists both of the crawler and locomotive type, states:

"Most of our experience has been with 8-wheel locomotive cranes, although we build a number of crawler-mounted machines equipped with diesel power. These machines have given very satisfactory accounts of themselves and we believe that the diesel engine will be used more and more on this type of handling equipment."

Some of the large walking dragline excavators such

as are used on Mississippi levee work have been equipped with diesels with great satisfaction. An interesting instance of the replacement of steam power on a No. 9½ dragline is found in Louisiana where a contractor found a saving in fuel alone of approximately $50 per 24-hour day.

A number of huge tower excavators similar to those developed by the U. S. Engineer Corps for Mississippi levee work are now powered with diesel engines. A notable example is one requiring 800 brake horsepower which was supplied by a land type diesel plant generating approximately 540 kilowatts.

A fine example showing the possibilities for the use of diesel compressor units is found on a water supply job in South Carolina. The contractor was confronted with the problem of building a tunnel approximately 4½ miles long to deliver the river water to a natural channel which would carry it some 9,000 feet to a pumping station. In order to remove the solid marl, a limestone formation, it was decided to use air spades with a small amount of explosive to crack up the formation. After careful consideration of various types of power, the contractor installed two 120-horsepower diesel engines direct-connected to angle compound air compressors. The air supplied by these units was conveyed along the tunnel line in pipes laid along the ground and down the various shafts so that the work could be started in both directions from each shaft simultaneously.

One manufacturer of mine and contractors' hoists, as well as dredging machinery, reports:

"We have never had any occasion to use diesel engines in connection with our hoisting equipment, but believe that if the newer developments will reduce the weight and size of the machine, it will be a practical type of power to use. However, this only will be suitable for the larger size units of which there are very few built each year."

The question of the use of diesel power on rock crushers, many of which are made as portable units, is of particular interest. A manufacturer of this type of equipment says:

"We have found the diesel type of motor or engine very successful and satisfactory where the conditions warrant the purchase of such a unit. In this statement we mean that where electric power is available, we do not recommend the purchase of any diesels or self-manufactured current. It does not pay. This work is extremely severe in shock loads. We know of no other class of machinery more so and we can say with a great deal of satisfaction that the diesel motor has done splendid work. To give some idea of the shock load, we would state that it is not possible for us to use in any way, shape or form, squirrel cage motors or even the new induction motor. Nothing but a slip ring will do. We have found that the diesel is the nearest thing to steam and slip ring motors."

A Help for Lumber Users

A NEW method of loading lumber for rail shipment, styled cargo-loading, which virtually eliminates damage in transit, has been evolved by the Weyerhaeuser affiliated sawmills, St. Paul, Minn. It may well be termed scientific lumber shipping, and is the culmination of studies and experiments by mills of the Weyerhaeuser affiliation to deliver their remanufactured and packaged lumber to retailer and user in as fine condition as when it left the machines.

It involves the thorough cleaning of cars, removal of any obstructions that may damage the shipment, and utilization of protective furring strips on car sides and floor, strips and paper coverings on end walls to protect lumber ends, and paper covering over the load to protect it against cinders and grime incident to rail transit. After the car is prepared, the lumber items that make up an order are loaded in groups, at a limited height, and the packages interlaced to obviate shifting and jamming. This limited-height loading is covered with paper or boards, and then the top loading of the packaged lumber is continued in the item-interlacing method, and where necessary the top load is bulkheaded to solidify the load into a compact unit.

If the top load consists of common boards rather than the packaged lumber, a 4 x 4 bunker is placed across each end of the car about 12 feet from the end walls and anchored in place. The boards are loaded over these, one end against the end wall of the car and the other end over the bunker. It has been demonstrated time and time again that loads with one end thus tilted over a bunker and the other at a lower level will stand all the vicissitudes of switch yard handling.

As is obvious, cargo-loading of the packaged lumber and other items that make up an order is, to say the least, a painstaking job. The loaders must be carefully trained, and considerable extra expense is involved. However, the fact that the load "comes through" in good shape, justifies the extra cost involved.

Three Reasons Why 4-Square Reaches the Dealer Undamaged. Every Empty Goes Through This "Purifying" Process Before It Is Used for 4-Square Loading. All Nails or Projections Are Removed, Holes or Breaks Repaired, the Car Swept and Then Washed

Foundation Construction

Follows Demolition of Famous Waldorf Astoria Hotel in New York to Make Way for Giant Office Building

The Waldorf-Astoria Hotel When Wrecking Operations Had Been Under Way About Two Weeks

FAME is fleeting. For decades the Waldorf-Astoria, at Fifth Avenue and 34th Street, New York City, was considered the leader of the famous hostelries of Manhattan. Its spacious salons and banquet halls, however, did not produce revenue sufficient to keep up with the business demands of the city so the site was sold and, on October 1, 1929, the demolition of this famous structure began to make way for an 85-story office building—the Empire State—which will probably be the tallest office building in the world. To the west of the Waldorf was Astor Court, a service street, lately used as a bus terminal. Fronting on the west side of Astor Court with one end facing on 33rd and the other end on 34th St. was the 8-story stone office building known as the Astor Court Building, which was part of the hotel property, and was also included in the purchase. This building was demolished at the same time as the hotel.

Demolition Proceeded Rapidly

Astor Court played an important part in the early work of demolishing the hotel, as it was possible to use it for loading trucks with the debris from the upper floors. Before any work on demolishing started, however, a sidewalk bridge was constructed, 428 feet long by 23 feet wide on 34th Street, a similar length and 11 feet wide on 33rd Street and 232½ feet long by 18 feet wide on Fifth Avenue. The sidewalk bridge was built with 8 x 8 posts along the curb and 6 x 8-inch sills on the sidewalks. The plates joining the sills to the posts were 2 x 8 inches and the stringers along the top for the roof 2 x 6 inches with 2 x 4 cross pieces and ⅞-inch sheathing covered with roofing paper and open on sides to drain to the street. Above this were placed 8 x 12-inch stringers and joists with 3 x 12-inch decking. The height from the sidewalk to the decking is 11 feet and to the water table 8 feet.

This structure was built solid enough to use for handling some of the materials in demolishing the hotel and also for unloading materials from the street and for storage during construction.

Salvage

Most of the steel work of the old hotel was salvaged and may be used in smaller structures at a later date. Perhaps the most interesting salvage was the saving of four old A. B. See elevators which will be reinstalled during the construction of the new structure, for use as temporary passenger cars.

Disposal of Wreckage

Between October 1, 1929, and January 13, 1930, the Waldorf was completely wrecked to the first floor. The wrecking of the steel work to the sub-basement was completed on March 10, 1930, and the old masonry walls and foundations were wrecked between January 14 and March 12, 1930. The removal of all footings, machine foundations and weight bearing walls constituted a difficult problem. Some of the steel work in the building was comparable to bridge construction, particularly the trusses supporting the grand ballroom.

The wrecking of the structure to the curb level and all the excavation work was handled by the general

contractors, Starrett Brothers, Inc., and involved the hauling of 17,722 loads of 5½ cubic yards each or 97,471 yards, place measurement, of old masonry, plaster and other construction materials. The wrecking of the old foundation walls and footings involved the removal of 6,599 loads of 3 1/3 yards each or a total of 23,097 yards, place measurement. A total of 15,000 tons of steel was removed down to the second basement.

EXCAVATION

The excavation of the 197-foot 6-inch x 425-foot lot began on January 22, 1930, and was completed on March 17, 1930. While the excavation did not involve any unusual problems, there was one rather delicate task along the south side of the excavation where the tunnels of the Long Island Railway leaving from the Pennsylvania Terminal at Seventh Avenue run within 15 feet of the building line horizontally. The deck of the tunnel is 50 feet below the curb. This made light blasting a necessity. James Forgie, consulting tunnel engineer for the Long Island Railway, cooperated with the contractors in giving the advantage of his knowledge of the construction features of this tunnel while the blasting operations adjacent to the tunnel were in progress.

Because of the rocky nature of the excavation no cross-lot bracing or shoring was needed, except to support the sidewalk vaults which had been constructed for the hotel. These were supported from the level of the hotel sub-basement which was about 10 feet above the sub-basement of the new office building. None of this will be removed until the office structure has progressed considerably toward completion.

Compressed air equipment for handling the extensive drilling preparatory to blasting included two electric-driven stationary Ingersoll-Rand 1,100-cubic foot per minute compressors mounted on the sidewalk on 34th Street, two electric Ingersoll-Rand 12 x 14 compressors of 550-cubic foot capacity each in the pit and four portable gasoline driven compressors of the same make. Air from the stationary compressors was piped in a 6-inch line around three sides of the excavation, the line being stepped down successively to a 2½-inch pipe at the end. As many as 80 jackhammers and pavement breakers were used in the excavation at one time.

Two blacksmith shops were located in the sidewalk vaults on the job and were equipped with Ingersoll-Rand pneumatic sharpeners. These handled the sharp-

THE SITE OF THE EMPIRE STATE WITH EXCAVATION UNDER WAY IN THE FOREGROUND WHILE DEMOLITION CONTINUES

Note sidewalk bridge with contractor's office at right

DEMOLITION COMPLETE EXCEPT FOR ASTOR COURT WHICH IS SEEN IN THE BACKGROUND

The first ramps used for hauling out excavation are seen at the right leading up to Astor Court

ening of all steel on the job. Many of the jackhammers were equipped with detachable bits which greatly speeded up the work.

USE OF DYNAMITE LIMITED

Blasting was done at about one-half hour intervals during the excavation. The blasts were small because of the proximity of office buildings with large exposures of plate glass and the controlling city ordinance. All blasts were covered with wire cable mats to confine the rock. In connection with the blasting, it is interesting to note that between 400 and 500 large plate glass windows were braced by the contractors with crossed wires and snubbers in the district on 33rd and 34th Street and Fifth Avenue within a block to a block and a half of the blasting operations. During all of the blasting only one window was broken and that was over one block away from the job.

Starrett Brothers were given a fourth class permit allowing the storage of 100 pounds of dynamite on the job. When the second shift was put on, a second magazine of 100 pounds capacity was permitted. Du Pont 40 per cent gelatin dynamite was used throughout and the magazines were kept filled by frequent visits of the local service truck of E. I. du Pont de Nemours & Co.

MOVING THE ROCK

Removal of the rock was handled by three Lorain 75-B power shovels, one Koehring shovel, two Speedcranes, one Browning crane mounted on a Mack truck and two 10-ton stiffleg derricks with 2-yard steel skips.

The rock excavation involved the hauling of 7,591 loads of rock of 3½ yards each and 1,655 loads of earth of 4½ yards each, place measurement. The hauling of debris from the structure and excavated materials from the old foundations and for new cellar and pier holes was sublet to the Halsey Trucking Co. of New York and Brooklyn, which had as many as thirty-seven 5-ton Mack trucks on the job at one time. Part of the excavation was hauled to East 28th Street where it was dumped into scows at O'Brien Brothers dock and part was hauled to North Beach, L. I., for fill at the New York Air Terminals airport described in the April, 1930, issue of CONTRACTORS AND ENGINEERS MONTHLY.

A succession of ramps were used to permit the entrance and exit of the trucks during excavation. Before Astor Court, which was a roadway supported on a steel structure, was removed, two ramps, as shown in one of the illustrations, extended from it into the center of the excavation. Following this, a short steep ramp was constructed from 33rd Street near Fifth Avenue into the excavation down which the empty trucks ran and passed under a longer, L-shaped ramp of easier grade up which the loaded trucks ran to 34th Street. At the bend of the L-shaped exit ramp, there was a loading platform on which an empty truck could park and be loaded by one of the 10-ton stiffleg derricks using 2-yard skips. The ramps were built of 12 x 12 timber with 3 x 12 and 4 x 12 bracing and 4-inch decking.

The bulk of the excavation was handled by the shovels with the derricks and skips handling minor por-

tions. The Browning truck-mounted crane was used on Astor Court to lift out the bottom steel and load it onto trucks. The Speedcranes were used particularly for loading the rock from the general excavation at the pit and earth and rocks from the pier holes, and for moving the mats for covering blasting operations. They were also used to help erect the ramps and in erecting the steel stiffleg derricks and then finally, by the steel contractors, in erecting their own 9 derricks for steel erection.

The excavating was handled in two shifts, the drills working two 8-hour shifts and the shovels two 9-hour shifts. The entire site was illuminated with twenty-one floodlights, each containing two 1,000 candlepower incandescent lamps, which made the job as bright by night as by day.

The only underpinning which was necessary was the west end of the job where the east wall of 27-31 West 33rd Street was underpinned by easy stages between February 1 and March 12, 1930.

Bracing of Sidewalk Vaults, Old Bearing Walls, and Derrick Used for Handling Skips

PUMPING

For pumping out the pier holes and pits a novel method was used, taking advantage of the proximity of the mains of the New York Steam Corp., which carry 90 pounds pressure. This steam was carried around the

EXCAVATION AT OLD BASEMENT LEVEL. RAMPS IN FOREGROUND FOR ENTRANCE AND EXIT OF TRUCKS.

Note truck being loaded by skip on exit ramp and also the power shovels cleaning up the debris

job in a 4-inch main, tapped at convenient points and piped to a steam siphon or ejector in the pit which lifted the water 40 feet into the sewers.

ELECTRIC CURRENT ON SITE

Direct current up to 1,000 horsepower was handled through the old hotel switchboard. This current will be used to operate the four old A. B. See elevators mentioned above and also for operating the power house on the 34th Street side to hoist materials and on various units where A.C. current will not be used.

Alternating current is purchased from the United Electric Light & Power Co. of New York up to a capacity of 2,500 horsepower at 220 volts. This power is used by the steel contractor on his erection derricks and will later be used for eight hod hoists for materials and on various items of equipment used throughout the construction period. The permanent electric service for the building will also be by A.C. current.

PLACING THE STEEL COLUMN BASES

The steel subcontractors, Post & McCord of New York, operated four steel derricks on the 34th Street side and four on the 33rd Street side with one in the center. All unloading of steel was handled from the 33rd Street side and then relayed across the site as needed. The steel derricks were served by Lidgerwood electric hoists. The capacity of each of the five center derricks handling the heavy columns for the tower section is 50 tons, while the remaining four end derricks are of 20 tons capacity each.

A novel method of plumbing the billet plates was used with invested bolts instead of shims. Bolts were inserted at two adjacent corners and in the center of the opposite side. The hexagonal nuts on the tops of these bolts when turned trued the billet plates after which the usual grout was applied for bearing.

POURING THE COLUMN FOOTINGS

Concrete for the 210 column footings was supplied entirely by the Transit Mix Concrete Corp., of New York City, which delivered concrete specifications to six hoppers located at sub-basement level. About 15 or 16 men with Ransome buggies wheeled the concrete distances of not more than 60 feet in various directions to the column footings.

PERSONNEL

The Empire State Office Building is being built by Empire State, Inc., of which Alfred E. Smith is President and Robert C. Brown, Vice President. J. V. McInerney is the owner's representative on the job. For Starrett Brothers, Inc., New York, the general contractors for the project, John Bowser is Superintendent and H. J. Stellmann is Field Office Manager. Post & McCord, New York City, are the subcontractors for the steel with Andy Morrison as Superintendent. Homer G. Balcom, New York City, is consulting engineer on steel work and Shreve, Lamb & Harmon, New York, are the architects for the building. Photographs are by Knickerbocker Photo Service, New York City.

American Civil Engineers Handbook

THE fifth edition of this standard civil engineering handbook closely follows the plan and scope of the first four editions of which the late Mansfield Merriman was Editor in Chief. The present edition has been thoroughly revised and brought up to date. Much new matter has been added, many new cuts have been included and the entire work has been reset. Compared with the fourth edition, the number of pages has been increased from 1,995 to 2,264. The large size of the book has suggested offering this edition both under one cover and under two. In two volumes it will serve the convenience of engineers who travel and those engaged in field work. The order of the sections has been changed to provide a more logical arrangement. The first eleven sections present general principles and materials, the second eleven sections treat of principles, design and application in the several fields comprised under civil engineering. This order facilitates the use of the two volumes. The complete index is included in each of the two separate parts.

Thaddeus Merriman, as Editor in Chief, has been assisted by Thomas H. Wiggin as Associate Editor in Chief, who has supervised the bringing out of this edition. The editorial staff has been changed by the withdrawal of Ira O. Baker, deceased, Louis Fischer, deceased, Arthur H. Blanchard and Frederick E. Turneaure, whose places have been filled by Walter J. Douglas, Wilmer Souder, John F. Crandell and Arthur G. Hayden, respectively and by the addition of Harrison P. Eddy and Charles J. McCarthy.

The various sections cover mathematical tables, mathematics and mechanics, chemistry, physics, meteorology, weights and measures, steam engineering, electrical engineering, surveying, geodesy and railroad location, materials and construction, foundations and earthworks, timber structure, masonry structures, plain and reinforced concrete, steel structures, hydraulics, pumping and water power, water supply, dams, aqueducts, canals, shafts and tunnels, irrigation and drainage, sewerage and sewage disposal, refuse collection and disposal, harbor and river work, highway engineering, steam railroads and electric railroads.

This volume is published by John Wiley & Sons, Inc., New York, and sells for $8.00.

Ready-Mixed Concrete for Long Slim Road Job

(Continued from page 66)

Ransome 3-yard mixer. The run to the job took about one-half hour through streets filled with heavy local traffic.

METHOD OF POURING

At the job the trucks ran alongside the strip on the west side of the road, delivering the concrete through an extension coal chute to the strip, the control of the flow being handled by one man, who operated the gate and signaled the driver to raise the dumping mechanism of the truck to speed up the flow of the concrete to the chute.

A gang of 8 men effectively handled the placing and tamping of the concrete, 4 men shoveled the concrete and smoothed it out generally, 1 tamped the concrete with the back of his shovel, another swept any concrete which might have been spilled on the roadway into the widening strip, 1 handled the chute, 1 the gate on the truck and the foreman made himself generally useful.

A 3-cubic yard load of the concrete took care of about 63 feet of widening strip. With the fleet of 6 trucks and the crew mentioned above, about 2 miles of widening strip was laid per day. The particular crew which worked on this job holds the record of handling 130 loads of 4:12:20 concrete base per day. Thomas J. Catlaw, Superintendent for George M. Brewster & Sons, contractors of Bogota, N. J., was in charge of this interesting job.

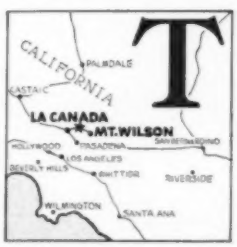
Hanging a Road *on a* Canyon Wall

By

A. N. George

Resident Engineer

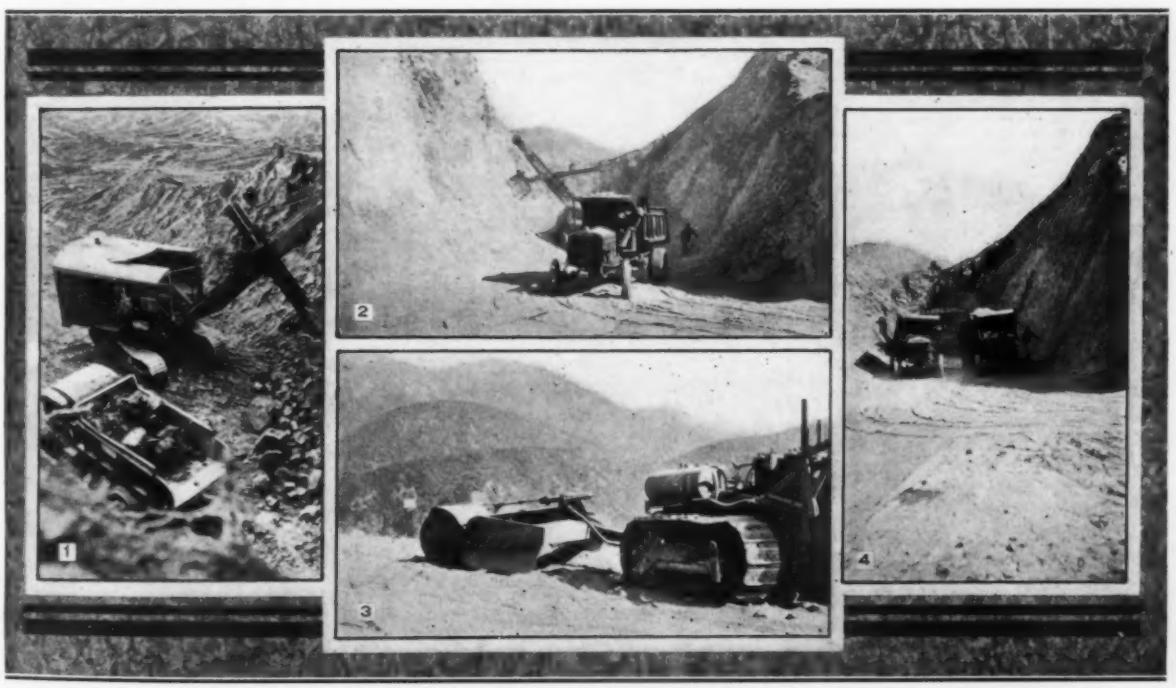
California Division of Highways



THE La Canada to Mt. Wilson Road is classified under the California State Highway System as a secondary road, and is, primarily, a scenic and recreational road. Starting at a point but 12 miles from the center of the city of Los Angeles it at once enters wild and rugged country, and passing through a saddle, hangs on the precipitous walls of the Arroyo Seco about 600 feet in elevation above the floor of the canyon.

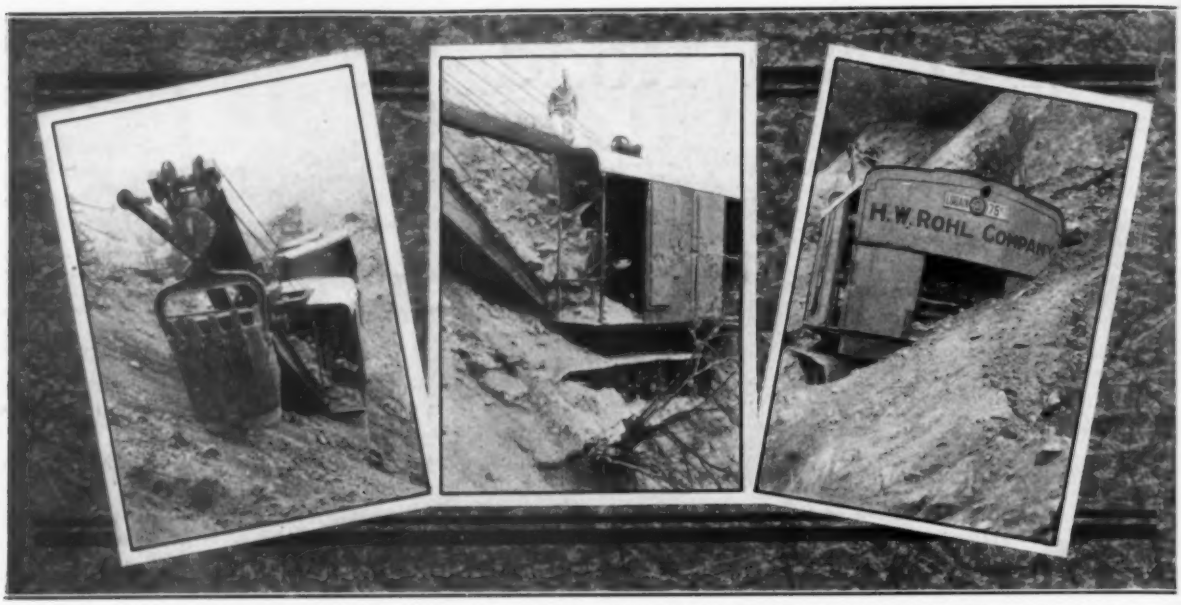
This road is expected to carry a very heavy traffic of pleasure cars on Sundays and holidays, and has been located with a 6 per cent maximum grade which has been compensated for curvature. The minimum radius of any curve is 200 feet, and the roadway width is 24 feet with 3-foot side ditches. Parking areas are being provided at points of scenic vantage, and every effort is being made to conserve natural beauty and to make these beauties accessible to the public.

As the natural slopes of these canyon walls are 45 degrees or more, fills will not hold, and the road is being supported where necessary on concrete crib retaining walls of the Massey type. The excavated material is hauled to side canyons, which are crossed by the line and which have a sufficiently flat bottom slope to carry a fill. As any material which is overcast on the main canyon slopes would roll to the canyon bottom and destroy all of the intervening vegetation no overcasting is being permitted, and the contractor is required to carry on his blasting operations in such a manner as to avoid throwing rocks and earth over the slope.



GETTING OUT THE DIRT IN THE CUTS

1. A 7-yard truck and a 1¼-yard Northwest shovel in hard digging. 2. A 1½-yard Northwest shovel and two 7-yard trucks in a through cut. 3. A McMillen hydraulic scraper operated by a Sixty Caterpillar tractor. 4. A 1½-yard Northwest shovel and two trucks showing method of spotting trucks for loading in a through cut.



THIS DIRT MOVED WITHOUT ANY HELP FROM THE CONTRACTOR—A LANDSLIDE THAT NEARLY TOOK THE LORAIN-75 OVER THE EDGE

This slide occurred after the article was written. It shoved the big shovel 5 feet sideways and the machine stopped with its outside crawlers on the edge of a 150-foot cliff. The slide was so sudden that the operator had no time to leave his shovel, but was unhurt. About 4,000 cubic yards of material came down in this slide.

CONTRACT AWARD AND PRICES

A contract for the construction of the first unit of this road, 2.65 miles in length, was awarded to the H. W. Rohl Co. in September, 1929, for a total price of $244,532.40.

The unit prices and estimated quantities were as follows:

140	Stations. Clearing and grubbing right of way	@	$ 25.00
400,000	cu. yds. Roadway excavation, unclassified	@	.38
3,500,000	station-yards overhaul	@	.005
6,260	cu. yds. Structure excavation	@	1.00
355	cu. yds. Class "A" portland cement concrete structures	@	25.00
18,000	lbs. bar reinforcing steel	@	.05
1,800	linear feet 24-inch corrugated metal pipe (placing)	@	1.00
110	linear feet 36-inch corrugated metal pipe (placing)	@	1.50
90	linear feet 60-inch corrugated metal pipe (placing)	@	2.00
1,970	pieces 6-inch reinforced concrete header cribbing	@	3.53
2,730	pieces 10-inch reinforced concrete header cribbing	@	4.65
4,120	pieces 6-inch reinforced concrete stretcher cribbing	@	3.18
3,320	pieces 8-inch reinforced concrete stretcher cribbing	@	3.56
1,250	pieces 10-inch reinforced concrete stretcher cribbing	@	4.34
170	pieces concrete filler blocks	@	1.00
3	miles new property fence	@	500.00
140	Stations. Finishing roadway	@	10.00
96	monuments, complete in place	@	3.00

Due to his having other work under way the contractor made little more than a technical start in September, and it was not until November that he began really to move equipment on the job, but by December he had the following equipment on the project:

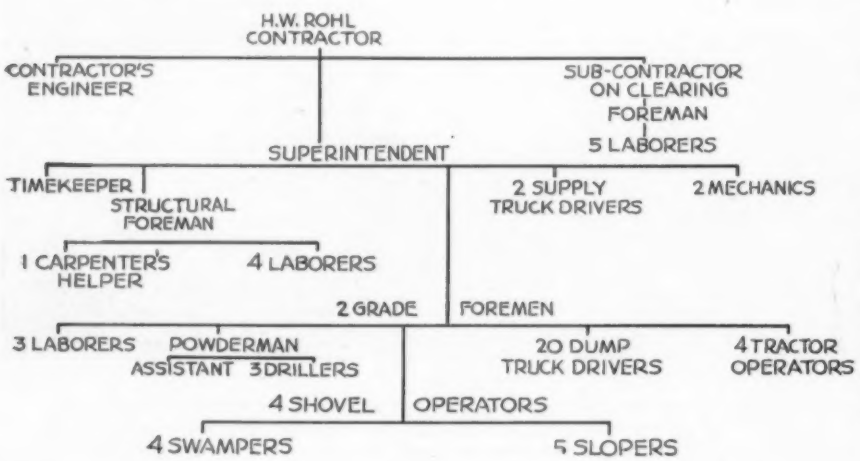
EXCAVATING EQUIPMENT

Gasoline Power Shovels	Tractors
1 1¼-yd. Lorain Thew	1 Fordson with bulldozer
1 1¼-yd. Northwest	2 30-hp. Caterpillars & bulldozer
2 1¼-yd. Northwest	2 60-hp. Caterpillars & McMillen scrapers

1 Ingersoll-Rand portable compressor, 250-cu.-ft. capacity
2 Jack hammers and drill steel
1 Blacksmith shop, complete
1 Ingersoll-Rand pneumatic drill sharpener

HAULING EQUIPMENT

Dump Trucks	Supply Trucks
4 Sterling dump trucks (Special 9-cu. yd. beds)	1 2½-ton Graham flat rack
16 Sterling dump trucks (Special 7-cu. yd. beds	1 1-ton Ford flat rack
	1 Dodge screen side delivery
	2 Ford delivery



The organization of the contractor's personnel is given in the diagram.

SPECIAL DUMP TRUCKS

The outstanding equipment feature of the work is the use of 7 and 9-yard dump beds on Sterling trucks. These beds are built to a special design drawn by the contractor, and the capacity is measured to the top of the bed only. The 7-yard bodies are on 5-ton trucks and the 9-yard bodies are on 7½-ton trucks. No tail gates are used, but a steel apron is car-

ried out 18 inches behind the bed proper. The trucks carrying these large beds are only equipped with four wheels, and they use single solid rubber tires. A special rear axle, however, has been found necessary and also a special frame.

PLAN OF OPERATION

The general plan of operation is to climb as high above grade as is practicable in making the first shovel cut, bringing the slopes which are above the reach of the shovel on this cut down by hand, succeeding cuts being made in 12-foot lifts. The contractor has selected his shovel operators with special thought in regard to their ability to dress a true slope with their dippers, with the result that once the slopes have been brought down to within reach of the shovels almost no more hand work is required to produce a slope which is true to section and pleasing to the eye.

The Caterpillar tractors were first used in making some light cuts and fills at the lower end of the work, and on the completion of that they have been employed in maintaining a surface for the trucks to haul over.

The material in which the road is being constructed is granite in various stages of decomposition, about 60 per cent of which is requiring light blasting in order to allow it to be handled to advantage. The drill holes are first sprung with 40 per cent dynamite, and are then shot with black powder, electric detonators being used throughout.

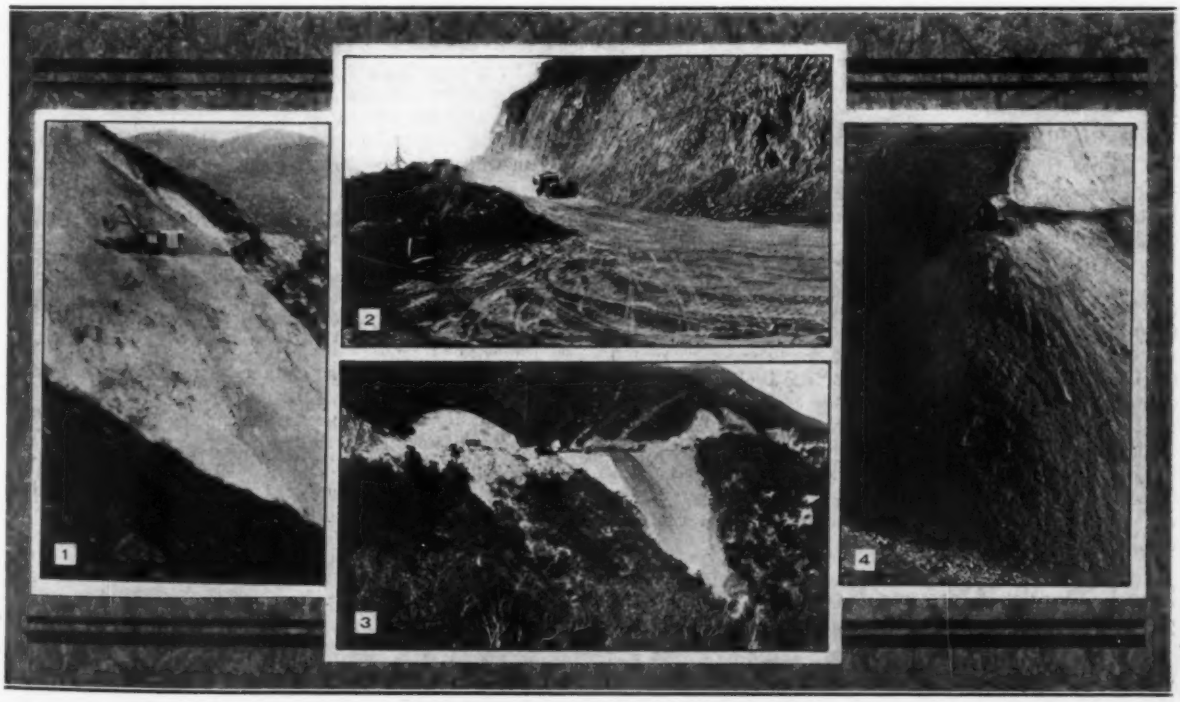
HIGH CLASS LABOR

Most of the contractor's men have been with him for several years and the bulk of them are paid by the month; it might be added they are paid at least 25 per cent above the scale. This policy allows the contractor to demand and obtain a high efficiency. An observer from the Bureau of Public Roads, who is making a time study of the operations on the job, remarked that the power shovels are showing an efficiency of 85 per cent as compared with 45 per cent, as is frequently met with on grading jobs.

UNUSUAL CONDITIONS

The project is parallelled by an 8-foot construction road, built and maintained by the Southern California Edison Co., in conjunction with their 220,000-volt transmission line which traverses the mountains in the general vicinity of the highway. This road has been of great assistance in allowing work to be carried on at numerous points on the job. Had it been necessary to keep the Edison road open for through traffic during construction of the highway it would have been a serious expense, but by a rather bold enterprise the contractor built a connecting road to the Edison road, and he was thereby allowed to close it.

One of the most annoying items of the work has been the clearing. As the contract was awarded in the summer time, when the United States Forest Service would permit of no burning, the brush was cut and piled in the right of way, in the anticipation that fall rains would occur which would permit the brush to be burned. However, the autumn proved to be absolutely without rain, the first rain occurring in January. This was a condition that had not prevailed before for 50 years, and caused much extra cost in rehandling the brush to permit the grading work to proceed. When the first rain did occur a large force of men was put on and the brush was kept burning night and day until it was all reduced to ashes.



LANDING THE DIRT ON THE BIG FILLS

1. *Working on the face of a cliff.* 2. *There is still* 15 *feet of dirt to come off this road and be dumped on a nearby fill.* 3. *This fill across a side canyon contains* 86,000 *cubic yards.* 4. *A long slide if he backed too far. A* 7*-yard dumping for a* 30,000*-cubic yard fill.*

How the Other Fellow Did It

Construction Briefs

One Handling of Cement from Car to Paver

20. An Ohio contractor has developed a novel way of handling cement direct from the cars to the paver. The cement was emptied into steel boxes or buckets which were placed by a hand derrick in the bodies of the truck hauling the batches. The use of the steel boxes greatly speeded the handling of the batch trucks at the loading platform and did away with the men usually employed to empty the bags onto the batch near the mixer. The boxes measured 2 x 2 x 2 feet and were made of welded sheet steel. Each box was equipped with a pair of hooks on the bottom edge which caught on the rear of two rods in the steel truck bodies and held the box while the cement emptied into the aggregate.

At the track where aggregate and cement were unloaded a platform 14 feet and 5 feet wide was built on heavy timber skids. It stood as high as the freight car door. On this platform a hand crane made of 4-inch pipe was erected with a braced arm holding a chain fall. The empty cement boxes were piled on the platform and one at a time were filled with 7 bags of cement. The crane then picked up one box at a time and swung it out over a truck as it came from the two unloaders and batchers where the limestone and sand were put into the truck. The box was not hooked onto the bracing rods in the truck but simply placed on the batch just behind the forward rods. When the truck dumped, the box slid back and the hooks caught, holding it in the body. As the trucks passed the cement platform on their way to the batchers the boxes were tossed off and stored on the platform. In cases where all the boxes were out on the job and there were no filled boxes waiting on the platform, it was found very easy to fill the box and have it ready for the truck in the time it took the truck to get its batch and return. 17.6.367

Cutting 12 x 12 Piles Under Water

21. On a Government job in Michigan the contractor was called upon to "saw off squarely and not vary more than ½-inch above or below the designated level" 100 square pilings of 12 x 12-inch fir. The contractor did this work with two divers and a portable air-driven timber sawing machine. There were two diver tenders on the scow and one pile pole man to recover the ends of the pilings cut off 20 feet below the surface. The superintendent reported that the upkeep of the saw chains consisted of a charge of $3 for filing for every 100 fir timbers cut and the replacement of one broken tooth at a cost of $1.50. The only other upkeep consisted of cleaning the air motor once and the cost of oil and grease. Inasmuch as the work was done in cold weather, it was found necessary to inject alcohol into the air line to keep the air motor from freezing. One hundred square pilings were cut in 6 hours reducing the time of cutting to about one-sixth that of the usual method. 17.4.238

Road Trucks Governed to Control Speed

22. On a 6-mile bituminous macadam job in northern Ohio the contractor was unloading No. 1 slag as well as slag dust or screenings at one end of the job. The slag was delivered in hopper bottom cars on a siding that was on a slight down grade making it possible for the trucks which were used to haul the slag to spot the cars at the unloader with the minimum of effort. The foreman of the unloader kept the trucks moving rapidly, getting each truck out in about 1½ minutes. The average time for unloading a gondola car during the job was about one hour.

The trucks were equipped with governors to control the road speed. There was much good-natured rivalry between the various truck drivers as to who would turn in the largest number of loads each day. The use of governors prevented racing on the rough grade and protected the trucks from undue wear, thus lengthening the life of the units, which represented an appreciable investment, and greatly reducing repair costs and the chances of accident. 17.3.153

Excavation with Little Headroom

23. Excavation under very unfavorable conditions was handled with belt conveyors in the building of the Long Island Subway, New York. Using four belt conveyors in one shaft with 18 men, it was possible to remove over 1,800 cubic yards in a 48-hour week. The first 6 or 7 feet directly under the street surface was a tangled mass of water and gas lines, sewers, house connections, telephone and light wire cables, all of which had to remain undisturbed during the construction. The surface street cars ran on a track located in the street just above the excavation. The soil is a sandy loam readily handled by hand shoveling and belt conveyors.

It was decided to use narrow dump cars to haul out from the excavation. The street car track was supported on special steel work, while water pipe, sewers, conduits and gas mains, etc., were all supported by timber work. With all these temporary supports the available headroom was cut down to approximately 8 feet. It was found that a portable belt conveyor mounted on a special truck with a narrow gage axle permitted the speedy loading of the dump cars. A 24-foot by 18-inch plain belt conveyor with electric motor was used at first, followed by a second the same size and then three 21-foot x 18-inch machines and two 30-foot by 18-inch conveyors. The cost of getting dirt into the hoppers at the head of the shaft for dumping into trucks ran about 72 cents per yard and for hardpan with some boulders as high as $2.92. 17.5.290

Moving a 30-Foot Asphaltic Concrete Finishing Machine

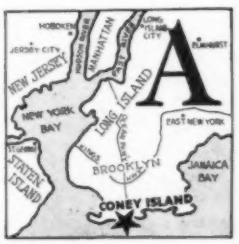
24. A machine which finishes the full width of a 30-foot asphaltic concrete highway in one trip must necessarily be heavy. During the operation of such a machine near San Bernardino, Calif., the entire weight of the machine was carried on cart wheels running on the side forms as a guide. The rigidity of the wide machine was assured by transverse members of rigid steel trusses. The moving of this machine after it was demounted from the 30-foot gage track was done with two dump trucks which had been used for hauling the asphaltic mixture. Operation No. 1 was to roll the machine by its own power on planks laid temporarily under the wheels to a position parallel to the roadway. When the machine was turned to this position dump trucks were backed to each end of the machine with the bodies of the trucks raised as when dumping. A heavy chain was passed across the rear end of each dump body and fastened to the end of the machine. The dump bodies were then lowered to hauling position. Due to the slightly forward position of the hinges this caused the raising of the extreme rear end of the dump body, thereby lifting the finishing machine from the ground. The remainder of the moving was a matter of team work of the two truck drivers, one driving forward and the other backing at the same speed. 17.5.285

Concrete Gun Repairs Pier Substructure

By

F. J. Spillane

Making the Semi-Plastic Concrete Mixture and Charging the Concrete Gun



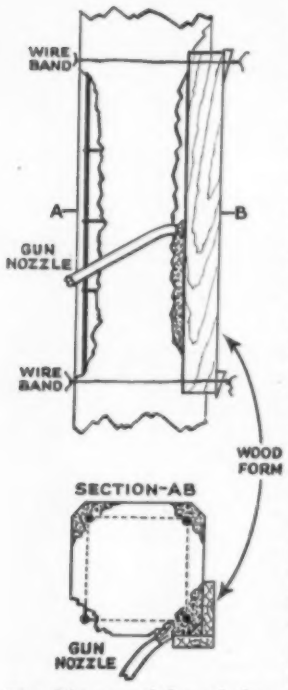
AT the New York Municipal Baths, located at Surf Avenue, Coney Island, the reinforced concrete substructure, consisting of piles, beams and cross members as well as the concrete floor, suffered serious damage due to weathering, and the action of moisture working through the concrete. This moisture reached the steel reinforcement, causing it to rust and expand so that sections of the concrete broke away entirely, to a depth of 2 inches or more, leaving the reinforcement exposed and weakening the entire structure. A contributing cause of the damage was the moisture which seeped through from the bath houses above and became frozen. In the winter time this structure is exposed to the elements and the action of salt water and spray.

In some places, the piles and supporting members for the floor were merely cracked, but the corners could be knocked off with a very slight blow or even picked off with the hands in large slabs of one square foot or more. In other places, the outer surfaces of the concrete had fallen away entirely, in lengths up to 10 or 12 feet. One of the girders was so badly broken away on both sides and bottom that it laid bare the entire steel reinforcement, which had become badly corroded due to exposure.

It was therefore necessary to patch these piles, beams and girders, bringing them out to their original alignment, and to repair the floor slab from beneath. Some of this work was done with the Quigley concrete gun, using a 1:2:2 mixture of portland cement, sharp sand and ¼-inch grit which was mixed in a mortar box with sufficient water to make it semi-plastic.

To repair a structure of this sort by troweling methods would have required the use of a very plastic mixture, which naturally would contain an undesirable quantity of water. Such a mixture applied by trowel, would cause shrinkage cracks at the junction point of the new and old material, so that after application, the new material would not bond to the old. With the strong, driving force of gun application, which handles a mixture that is drier than a trowel mixture, any excess water will work out to the surface of the new material as it is applied. This is due to the compression of the particles of grit and sand, each of which is surrounded with a film of cement. The gun application thus makes a patch which is strong, dense and waterproof, and a good bond is secured between the newly applied mixture and the original structure.

The Quigley concrete gun used for the work has a capacity of 2 cubic feet of mixed concrete, which quantity it discharges in four or five minutes, and requires about the same time to load. The semi-plastic mixture is placed in the gun and is shot through a long hose connection by compressed air using a ¾-inch pipe nozzle of any desired length, slightly curved at the tip and having an oblong aperture. There are no valves on this nozzle. The flow of material is controlled by the gun operator so that the man at the nozzle gives



This Diagram of One of the Piles Shows the Method of Shooting the Material in Behind a Wood Form Which Is Clamped to the Pile with Wire Bands

his entire attention to applying the material.

The driving force of the gun, which operates at 80 to 90 pounds pressure, shoots the premixed material deep into every crevice and makes a complete solid fill, well bonded, which is impossible to obtain by any hand troweling method. The mixture was applied in successive applications of ¾-inch to 1 inch in depth. Each was allowed to partially set and additional applications shot until the substructure was built out to original dimensions.

For repairing many of the piles, beams and girders, a wood corner-form was used. This form was made of 1-inch lumber and was securely wired to the pile or braced against the corner of the beam or girder. Then the mixture was shot in at an angle from one edge of the form, as shown in the diagram.

After the gun application was completed, the surfaces were gone over with a 1:2 trowel mixture of cement and sand to restore the uniformity and give a smooth finish.

The accompanying illustrations show the condition of the piles, beams and floor slabs prior to being repaired, and the finished work after they had been shot with the Quigley concrete gun and built out to the original alignment.

Air was supplied by an Ingersoll-Rand portable compressor, located more than 100 feet from where the repair work was carried on. The work was done by the Alliance Sand Blasting Co., of New York, under the direction of Eugene Vogel.

Applying the Concrete Mixture to One of the Badly Weathered Supporting Members. The Portable Compressor Supplying Air for the Gun Was Located About 100 Feet Away

Over-Run Contracts in Kentucky

IN Kentucky when the actual cost of construction of any road or bridge exceeds the estimated cost, it has been determined that a contract is necessary to provide for the additional payment. The present contract states, "This contract shall not be construed to be an obligation of the Commonwealth to expend any sum in excess of the estimated cost stated herein, and, provided further, that this contract shall not be deemed an obligation of the Commonwealth to pay any sum stipulated herein until it has been submitted to the auditor of public accounts and the certificate of the auditor of public accounts has been attached hereto as required by law.

"The party of the second part grants to the first party the option and right in the event there is an over-run and the estimated cost is consumed by computed cost on the basis of the unit cost, to require party of the second part to enter into a new contract with first party for the completion of all work remaining unfinished after the estimated cost has been consumed, at the same unit cost, and under the same terms and conditions contained in the original contract. If first party elects to exercise this option under this provision it shall give the party of the second part written notice of its election, and the part of the second part thereupon shall be bound and required to enter into a new contract for the completion of the work under the terms and conditions in the original contract."

The opinion of Leon P. Lewis, attorney for the Kentucky Association of Highway Contractors, as published in *The Scraper,* is as follows:

"Several years ago over-runs on contracts resulted in some very grave questions as to the validity of the obligations of the Highway Department in view of the constitutional limitation on expenditures. The present form of contract was obviously prepared to meet this situation and save the state and the contractors from danger of contracts, or parts of contracts, invalid because in excess of the revenues for the biennial period, as defined by the Court of Appeals in the Billiter & Wiley case.

"The present contract specifically provides that although the total cost is an estimate, and the unit prices are to govern, the obligation of the Commonwealth is limited to the total of that estimate. It further provides that in case of an over-run the Highway Commission has an option to make a new contract with the contractor for the completion of the work on the same terms as the original contract. Unless this option is exercised, the contractor has no right to do work which at unit prices will exceed the estimated total cost, and if he does such additional work without the execution of a new contract, he will be in grave danger of being unable to enforce his claim.

"As to the new contract, I think it is perfectly clear that this contract must be written and must be submitted to the Auditor of Public Accounts for his certificate of validity before it is an obligation of the Commonwealth. A mere verbal order to continue work, in my opinion, is insufficient.

"In a word, I consider that those holding contracts with the State Highway Commission can protect themselves in case of over-runs only by the execution of a new formal contract, properly certified by the Auditor of Public Accounts."

It is well for any contractor doing work in Kentucky to realize that when any progress estimate reaches the estimated cost, that if he continues to work on the project thereafter, he is taking a very serious risk if he proceeds without the additional contract, as he will be in grave danger of not being able to enforce his claims for the additional work.

Arc Welding Used for World's Longest Pipe Line

THE longest oil carrying pipe line in the world, recently constructed between Cushing, Oklahoma, and Chicago, Illinois, was fabricated completely by the arc welding process. This line, known as the Texas-Empire Line, is owned jointly by the Texas Pipe Line Co., and the Texas-Empire Pipe Line Co., and through it oil will be pumped to the refineries of the Texas and Indiana oil companies. The main trunk of the line covers a distance of 624 miles and the branch lines are approximately 200 miles in length. The pipe line runs through all kinds of territory, crosses four large rivers and was constructed in five sections.

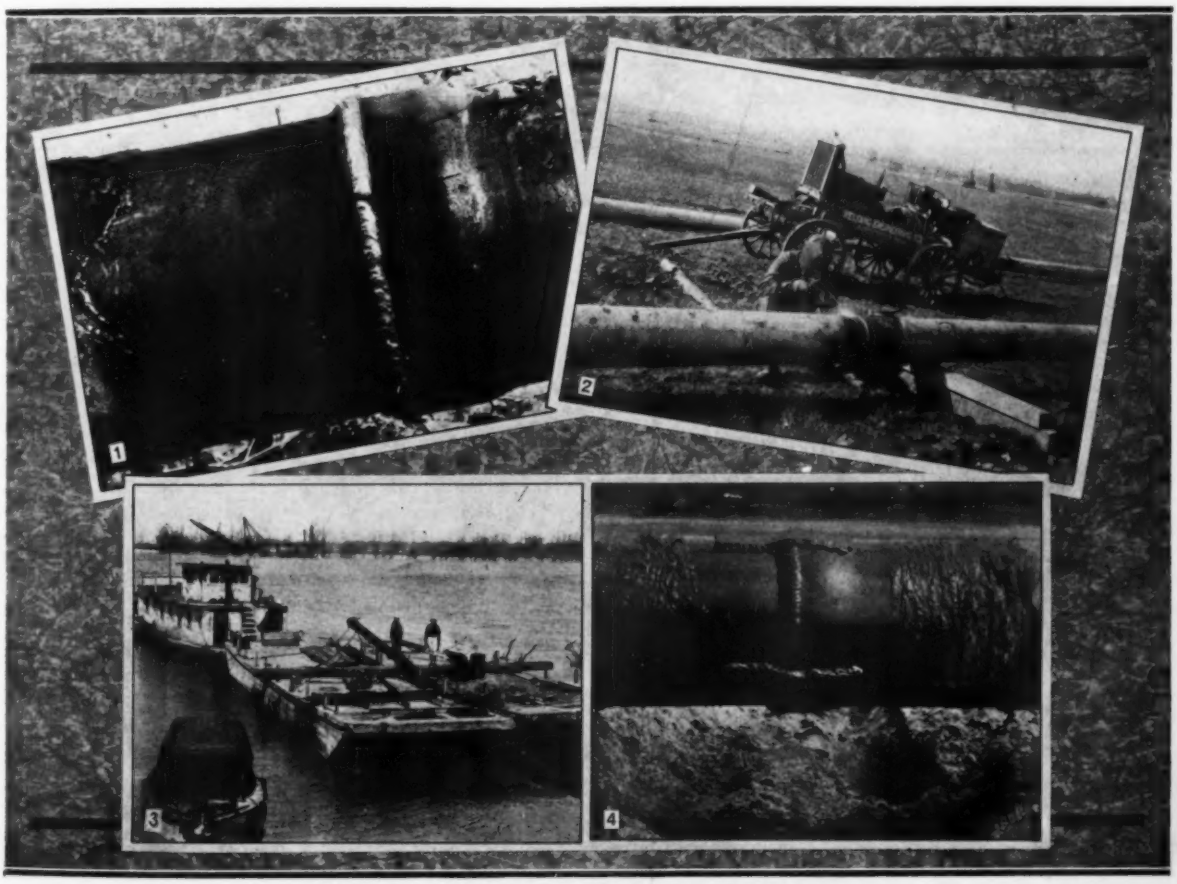
The pipe used in the main trunk, extending from Cushing, Oklahoma, to Wilmington, Illinois, is 12-inch electrically welded, with bell and spigot joints, and produced in 40-foot lengths. Exceptions were made at river crossings, where the construction was of the bell and spigot seamless type. From Wilmington to East Chicago, Indiana, 10-inch pipe was used and the two branches leading to Lawrenceville and Lockport were fabricated of 8-inch pipe.

All joints are arc welded. Each weld was completed in two beads which eliminated the possibility of pin holes which would result in leakage. The welding speed on the 12-inch pipe for the firing line from start to finish averaged 10.3 welds per man per day. The average rose in good weather and during ideal conditions a maximum of 25 welds per day on a 12-inch pipe was attained by some men. This is an average of 24 minutes per weld. The pipes were joined in sections and the bell-hole method was used in making these connections.

The line runs through both hilly and level country, and during the course of construction all types of climatic conditions were encountered. The work was started in winter when the ground was frozen. Spring thaws made it necessary to move the arc welding equipment through 15 inches of mud. Heavy and continuous rains following the thaws also hindered the work considerably and in many cases it was not until the middle of June that it was possible to weld pipe on dry ground.

During the construction of this line it was necessary to cross four large rivers—the Mississippi, Missouri, Arkansas and Illinois. Extra heavy pipe was used on these river crossings and a proportionately heavy weld was applied. At these places the pipe was of bell and spigot, seamless construction and straps were arc welded across the welded joints. On small rivers the pipe was welded in sections on the bank, pulled across and then tied into the line on the bank. In crossing large rivers it was necessary to place the pipe on a barge and lower it into the river after each joint was welded. Heavy river clamps were bolted over the joints before lowering.

The problem of moving the welding machines along the right of way was an important one. These machines were of the gasoline motor type, each driven by a 6-cylinder engine and weighing approximately 3,000 pounds. Ninety-one gasoline motor-driven Lincoln Stable-Arc welding machines were used in the construction of this line. They operated at 1,500 rpm to furnish a working current of 300 amperes for each welder



METHODS USED IN WELDING LONG OIL PIPE LINE

1. *The completed weld.* 2. *The welding equipment and the operator at work, welding a joint.* 3. *The pipe being drawn across the Illinois River by a barge.* 4. *Straps arc welded across the arc welded joints on the pipe used at river crossings.*

and consumed a total of 1,200 gallons of gasoline per day. These machines were moved by 2-ton Caterpillar tractors. On the tying gangs, however, it was found advantageous to have a team of horses for each one of the units.

Rigid inspection and testing of this pipe line have made it unusually strong and complete. Each weld was thoroughly inspected both by the line owners and the welding contractor. Periodically coupons were cut from the welds of each operator to inspect its size and penetration and to show a cross section of the weld. Any welds that did not measure up to proper specifications were marked and rewelded.

Hydrostatic pressure tests of 800 pounds per square inch were made on this line as quickly as sections were completed and pumping arrangements could be made. In a test of 354 miles, only 3 pin holes were found, which were immediately repaired. The Welding Engineering Co., Bartlesville, Okla., were contractors for this job.

An Unusual Blasting Job

AN unusual job of blasting was done at Wilmington, Delaware, when dynamite was used to crack and break down a slab of reinforced concrete weighing more than 160 tons which had served as a counter-weight for the arm of hammerhead or fitting-up crane at the plant formerly operated by the Bethlehem Shipbuilding Corp., on the Christiana River. The fact that the massive counter balance was located at a height of 107 feet from the ground to the bottom of the slab gave a spectacular angle to the blasting.

The approximate size of the slab was 14 x 17 feet, with a thickness of 9 feet. On sides, ends and bottom was heavy structural steel, while embedded in the concrete were ¾-inch steel rods at intervals of 4 inches. These were anchored to steel beams at each end of the framework. The concrete had been poured in place and was firmly fixed to the steel members of the crane. In addition to the reinforcing rods, there were two diagonal struts extending from the four bottom corners of the frame in which the weight rested.

The 160-Ton Concrete Balance Reduced to Fragments. At the Right Is Seen the Base of the Massive Hammerhead Crane

It was originally planned to blow out the concrete with a single shot of a series of holes of 6-foot depth but a decision to break down the slab with several smaller shots was reached after studying the problem, which involved doing the blasting without damage to the steel work or to steamboats which were moored at a nearby wharf. One of the boats was within 150 feet of the foot of the crane.

Practically three-quarters of the concrete was blown out the first day when the initial shooting was done with 25 pounds of 50 per cent dynamite loaded in holes and was followed by a mudcapping shot, for which 7 pounds of the explosive were used. The mudcapping method was used several days later when the work was finished by shooting 12 pounds of dynamite and following it with a shot for which 9 pounds were required. All of the shots were detonated by means of electric blasting caps and a blasting machine.

C. G. Mathewson, Wilmington, Del., did the loading and shooting and was assisted by a member of the Explosives Department of E. I. du Pont de Nemours & Co.

The Last of the Three Mudcapping Shots Which Completed the Demolition of the Concrete Counterweight

Daily Time Charge on Connecticut Highway Contracts

A CHANGE in the method of applying the bonus and liquidated damages clause on Connecticut State Highway Department contracts is to be made for the first time in projects on which bids are now being asked.

The attention of bidders is particularly called to the first item of the proposal forms "Working Days" for which a specified charge per day is required. The number of working days is to be filled in by the contractor, multiplied by the stated amount per day and added to the total amount of the bid.

Should the successful bidder complete the contract in a smaller number of working days than stated on his proposal form, he receives a stated sum per day as a bonus for each and every working day that the contract is completed within that time. Should the completion of the contract require a greater number of working days than stated by the contractor on his proposal, the Department is to deduct the specified sum per day from money due to the contractor.

The same provision relative to the definition of a working day to the extension of contract time and any provision not definitely superseded by the new clause remain as stated in the standard specifications. Contractors should not neglect to fill in the number of working days as bids will be rejected if this part of the proposal is not complete.

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Dangers of the Dotted Line

The contractor who is too busy to read contracts and other documents he signs is one of the best friends that the lawyer's pocketbook has. Next to a fussy old lady of wealth who insists on writing her own will there is no one who pays for more Lincolns, Cadillacs, Packards, etc., for attorneys to drive around in on Sundays than the business man who signs in haste and repents at leisure.

People have gotten pretty well over handling guns under supposition that they are not loaded, without first making sure that they are not. But they still persist in using their ears and spirits of trustfulness instead of their eyes and caution in making contracts.

In a case lately decided by the Springfield, Mo., Court of Appeals a man was sued on notes given for the purchase of supplies. He tried to avoid judgment by claiming that the salesman who induced him to sign the contract and notes had orally agreed to certain things that were different from what was stated in the written contract.

Let others profit by the experience of the gentleman from Missouri, who had to be "shown" by court order before he would believe that his signed contract was binding. The following statement of the court should be printed in large letters, framed, and hung over every business man's desk until he knows every word by heart:

"There is no contention that defendant was, by any artifice or trick, prevented from reading the contract and notes before he signed them, and it is familiar law that under such circumstances he cannot now be heard to say that he did not know the contents of the instrument he signed." (Stevens vs. Smotherman, 24 S. W. 2d, 670).

The Fruits of Delay

Delay is one of the chief causes for legal grief for contractors. There are two general classes of delay that commonly result in heavy money losses. One of them is delay in completing a job and the other is delay in enforcing payment.

The inventor of the phrase "Delays are dangerous" must have had some sad experience in the contracting field.

It does not require any consideration of integrity or pride in keeping one's word to impel one to do his best to finish a job by the time he has bound himself to do so. Labor and material costs are more apt to go up than down; so usually there is no incentive for "stalling" on that ground. Neglecting one job for another is risky business, because the neglected owner may get roiled enough to make the contractor litigate the question of damages for delay. So when profit may be received by sidetracking one job for another is apt to be offset or more than offset by trouble connected with the delayed job.

Even when the contractor has been perfectly punctual in performing his contract, a delay in filing a lien claim or in pressing a claim against an owner in shaky financial condition is dangerous. Despite what some one has said about being better late than never, many a contractor has found to his sorrow that you might just as well charge a claim off the books as to be late in trying to collect it.

Partner Cannot Steal from His Own Firm

Of course, a man could not be convicted of stealing money from himself. And because a partner is part owner of funds belonging to his firm the law says that it is impossible for him to be guilty of stealing or embezzling them. That is one very good reason for hesitating about forming a partnership in the contracting business with a man whose integrity may be in doubt, especially if money is to go through his hands. True, every member of a firm may be compelled by suit to pay over what belongs to his associates, provided he is good for money judgment. But it is no uncommon thing for a partner suddenly to decamp with firm funds and leave nothing for his trusting associates but liabilities to creditors of the partnership.

Two New Yorkers agreed to go into the business of buying and improving lots and selling them. Leuthe was to furnish be deposited in Leuth's name. Dye collected the proceeds of construction work, hire and fire men, etc. All money was to be deposited in Leuthe's name. Dye collected the proceeds of a mortgage and deposited them in his own account.

It seems that Dye failed to make proper accounting to Leuthe for these funds and a prosecution on a charge of larceny was brought. But in the case of People vs. Dye, 236 N. Y. Supp. 357, the Niagara County Court ordered the indictment dismissed September 11, 1929, on the ground that Dye was not an agent or employee of Leuthe, but a partner, and was, therefore incapable of stealing the funds.

An Aspect of Profit-Sharing Employment Contracts

"The Law will not guess money out of one man's pocket into another's." That is a principle that has been often applied in lawsuits. The Law says that one who breaks his contract can be required to pay damages to make good the other party's loss. But it also says that the latter must prove with reasonable certainty just how much he is out of pocket.

In a case lately disposed of by the Texas Court of Civil Appeals (Bender vs. Mettler, 17 S. W. 2d, 182), the main facts were that the manager of a business was employed at a monthly salary, with an agreement that at the end of a year he would be paid an additional sum equal to one-tenth of the net profits for that period. But he was discharged two months after he took the job, and two weeks later—more than nine months' before the year was up—sued for damages based on loss of his share of the profits. Under these conditions, the court held there was no basis for assessing such damages. Said the court:

"Under the terms of the contract, the unit of time for computing profits was one year. This period was indivisible. Plaintiff was entitled to profits only in the event it was disclosed, at the end of the year that a net profit was realized from the year's business."

In other words, plaintiff should have waited until the year was up before he sued. The court would not assume that a profit shown for the first two months would have been uniform throughout the year or might not have been wiped out by the end of the year.

Validity of Oral Agreement Supplementing Writing

There is a fundamental rule of law that forbids either party to a contract, over the objection of the other, to rely upon an oral agreement had in negotiations leading up to the execution of a written contract, where the effect would be to enlarge or contradict the terms of the written contract. But this rule applies only where the writing purports to state the whole agreement, and rests upon the idea that it is unjust that one who solemnly signs such a writing should be permitted to vary its terms.

Hence, where the writing purports to cover only certain features of an agreement, either party may show a concurrent or pre-existing oral agreement on other features.

Recognizing the last stated rule, the North Dakota Supreme Court held in the case of Larson vs. McKendry, 226 N. W. 640, decided August 16, 1929, that, where a contractor's proposal in writing to do certain work for a stated price clearly did not constitute the entire agreement, the owner was entitled to rely upon an oral guaranty of the contractor that the roof would not leak, although that guaranty was not embodied in the bid.

Contractor as Partner

There is no open season on "skinning" one's own partner. Partners are required by law to "tote fair" between themselves for 365 days of the year, excepting leap years when good faith must be exercised for one day longer. What might be "within the law" in ordinary business dealings between business man and patron may be a gross violation of a partner's duty to his associate or associates.

In a recent case, the Michigan Supreme Court cited the following "cannots" that the law hangs upon every member of a partnership, as declared by the highest court of the land:

One partner cannot, directly or indirectly, use partnership assets for his own benefit; he cannot, in conducting the business of a partnership, take any profit clandestinely for himself; he cannot carry on the business of the partnership for his private advantage; he cannot carry on another business in competition or rivalry with that of the firm, thereby depriving it of the benefit of his time, skill, and fidelity, without being accountable to his copartners for any profit that may accrue to him therefrom; he cannot be permitted to secure for himself that which it is his duty to obtain, if at all, for the firm of which he is a member; nor can he avail himself of knowledge or information which may be properly regarded as the property of the partnership, in the sense that it is available or useful to the firm for any purpose within the scope of the partnership business.

Breaking Contracts and Threatening to Break Them Distinguished

"When we took that job to construct a levee we did not foresee that material and labor costs would go up, and if things don't look up a bit we will have to throw up the job," is about what contractors said to the other party. But they kept up the work.

That did not constitute a breach of their contract, according to the view taken by the Mississippi Supreme Court in the case of R. T. Clark & Co. vs. Miller, 122 So. 475, decided May 20, 1929. The court said:

"It is true . . . that the positive refusal to perform a contract is a breach of it, although the time for performance has not arrived, but the mere assertion of a party to a contract that he *will be unable, or will refuse*, to perform his contract is not sufficient to constitute a breach. There must be a distinct, unequivocable, and absolute refusal to perform, treated and acted upon as such by the other party to the contract. A mere assertion of inability to go on with the contract is not a repudiation of the contract. The intention to abandon the contract at some future date is not a breach of it unless such intention is declared in positive terms and unconditionally."

Right to Withdraw Bid Before Unqualified Acceptance Recognized

There is this similarity between a contractor entering into marriage and his entering into a construction contract. In the one case, until both bride and bridegroom have promised to take each other "for better or for worse," etc., either one can back out and there is no marriage. In the other, despite the fact that he may have filed a bid on a job and deposited with it a check to secure entry into a contract on acceptance of the bid, he can withdraw any moment up to the time that the bid has been unqualifiedly accepted. In the first case, he might be subjected to suit for breach of marriage promise. In the latter, he would be under no legal liability at all for want of contractural obligation.

In the case of Tobey vs. Seaboard & Southern Construction Co., 149 S. E. 914, decided September 20, 1929, by the Supreme Court of Georgia, it appeared that the construction company had bid on a bridge job in Texas, putting up a certified check. On opening the bids, the governing board wired the company that its bid the bids, the governing board wired the company that its bid would be accepted *if* the company was found to be in satisfactory financial condition, and *if* the War Department approved the bridge plans. Considerable correspondence followed, but there was no acceptance of the bid before it was withdrawn. Holding that the company was entitled to return of its check, the court said:

"The bid of the construction company was an offer to contract, not binding upon it until legally accepted. . . . The Texas statute expressly provides that any and all bids may be rejected. Instead of requiring the contract to be let to the lowest bidder, the statute forbids letting to the lowest bidder until and unless the commission in exercising a discretion vested in them by law have approved his financial stability. It is our opinion that the offer made by the construction company was not accepted before its withdrawal, and that as the proposal was unilateral it could not develop into a contract until the party to whom the proposal was made had done something to make it binding upon himself. The acceptance of an offer must be unequivocal.

Liens Against Public Buildings Do Not Exist Unless Authorized by Statute

Liens are not a product of Nature. They exist only by virtue of state laws. And being the creature of legislative enactment the right to them can be no broader than the language of the statute. Usually lien laws are so worded as to apply to private property only. The right to sell a court-house, jail, city hall, school-house, or other public building, under foreclosure of a mechanic's lien is not recognized. So, the South Carolina Supreme Court was in line with what other courts throughout the country hold when it declared in its opinion handed down August 21, 1929, in the case of Atlantic Coast Lumber Corp. vs. Morrison, 149 S. E. 243:

"There does not appear to be any doubt of the proposition that public property may not be subjected to a mechanic's lien, except upon specific statutory authority. . . . There is no statute in this state making and authorizing a public building to be subject to such lien."

A Section of
CONTRACTORS
AND
ENGINEERS MONTHLY
Devoted to
News of Consultants
in the
Civil Engineering Field

The Consulting Engineer

May, 1930

New York

Vol. I, No. 5

Water and Sewage Plans and Construction

Office of J. N. Chester Engineers

REPORTS are now being prepared by the J. N. Chester Engineers, Clark Bldg., Pittsburgh, Penna., on sewage and sewage disposal for Wheeling, W. Va.; Warren, Penna.; Emlenton, Penna., and the Derry Township School District. Investigations are also being made on the possibilities of a patented fertilizer process as applied to sewage sludge.

J. N. Chester

A report is being prepared on the Newark, Ohio, water works and electric light system and plans are being made for a new generator unit for the municipal plant for the Borough of Etna, Penna. A similar installation is being completed for the State of Pennsylvania at the State Institution, Polk, Penna.

Sewage disposal plants are being completed at Greenville, Penna.; New Lexington, Ohio; Torrance State Hospital at Torrance, Penna.; Dixmont Hospital, Dixmont, Penna.; and the Watson Home for Crippled Children, Leetsdale, Penna. Plans are under way for a sewage disposal plant for the Commonwealth of Pennsylvania for the Rock View Penitentiary. Bids were taken on April 29 on a sewage disposal plant outfall sewer and improvements to Mill Creek for the city of Erie, Penna., at an estimated cost of $1,210,000. Contracts were let in March for an additional water supply, filtration plant, and pumping station for the city of Erie, having a capacity of 16 m.g.d. and costing $1,500,000. This includes a 72-inch intake line 8,900 feet long. In April contracts were awarded on an additional water works including a filtration plant and pumping station for the city of Shreveport, La., having a capacity of 8 m.g.d. and costing $500,000.

Valuations were completed recently of the properties of the Westmoreland Water Co., Greensburg, Penna.; the water works system, Erie, Penna.; and the Edgeworth Water Co., Sewickley, Penna. A new rate study has been made for the water works department of Wheeling, W. Va.

Work is being continued on the new filtration plant, pumping station and reservoir for the city of Lockport, N. Y., designed with a capacity of 8 m.g.d. and costing $500,000. This will be finished late this year.

Contracts have also been let for a booster station and filtration plant improvements for the city of Newport, Ky., and its construction is now in progress. A zeolite softening plant is being built for the municipal water works at Oakdale, Penna., the contract for which was awarded in April.

This firm recently was engaged as expert witness in the Passaic Consolidated Water Co. case where they represented the water company, and in the West Palm Beach Water Co. case where they represented the city of Pittsburgh in a lawsuit involving the financing of water department construction.

M. L. Carr Appointed Staff Engineer

ANNOUNCEMENT has recently been made of the appointment of M. L. Carr as Staff Engineer of the PITTSBURGH TESTING LABORATORY, Pittsburgh, Pa. Mr. Carr, who is a graduate of the University of Illinois, was for several years connected with the Underwriters Laboratories of Chicago and later was associated with the Safe Cabinet Co., Marietta, Ohio. Just prior to his affiliation with the Pittsburgh Testing Laboratory he was connected with Barrington Associates, New York City, an organization of business counsellors.

M. L. Carr

As Staff Engineer of the Pittsburgh Testing Laboratory, Mr. Carr will act as engineering consultant and co-operate with clients in solving their various problems relating to purchasing, production and sales.

The Consulting Engineer

A Section of

Contractors and Engineers Monthly

443 Fourth Avenue, New York

EDGAR J. BUTTENHEIM, President
THEODORE REED KENDALL, Editor
MYRON MACLEOD, Advertising Manager

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Horace M. Marshall, 1613 Monroe St., Vicksburg, Miss., is at present engaged in an investigation of the Mississippi River flood and backwater on the Yazoo and Big Sunflower Rivers, with a view to protecting 400,000 acres of land from the overflow. Mr. Marshall has recently acted as expert witness in the case of Long et al. vs. Y. & M. V. Ry. Transfer Co., in regard to the boundary line between the States of Louisiana and Mississippi and also in the case of Jones et al. vs. Anderson-Tully Lumber Co.

W. A. Fuller Co. Has Variety of Projects Under Way

AMONG the plans which are now being completed in the office of the W. A. FULLER Co., 2916 Shenandoah Ave., St. Louis, Mo., are water works and sewer systems for St. Clair, Mo., and Caseyville, Ill.; a paving project and sewer system for Fredericktown, Mo.; an electric lighting system and power plant for Sikeston, Mo.; a new sewer system for Waverly, Ill.; and a water works impounding dam for Highland, Ill. They are also preparing plans for water and sewerage systems for Virden and Girard, Ill., and a water purification plant and sewers for Waterloo, Ill.

Projects which have already been placed under construction and which are being supervised by Fuller engineers include a water filtration plant for Poplar Bluff, Mo.; water works improvements for Waterloo, Ill.; a sanitary sewerage system for Fredericktown, Mo., and a water works improvement extension for New Haven, Mo., as well as paving projects in Sikeston, Mo., and Winchester, Ill.

Diversified Projects Engage Attention of Engineering Service Corp.

AMONG the interesting projects now being planned and supervised by the ENGINEERING SERVICE CORP., 923 Post Dispatch Bldg., Houston, Texas, is the $500,000 Scobey dry and cold storage warehouse at San Antonio, Texas. This organization is also working on preliminary studies for docks and harbors for the Tidal Refining Co. at Houston, Texas, the Phillips Petroleum Co., and the Davison Chemical Co. They are also planning and supervising the construction of highways for the Tidal Refining Co. at their Houston plant, and are planning sewerage and water systems for Liberty, Texas, and dredging for Barbour Terminal, the latter of which will cost about $500,000. The firm has been called to give expert testimony in the case of Kocher vs. I. G. N. Railroad for damage from floods.

The personnel of the Engineering Service Corp. includes F. H. Shaw, Pres., Horace Culpeper, Vice-Pres., and W. F. Eblen.

Water Softening Plant Among Plans Being Prepared by Haskins

A WATER softening plant for Clay Center, Kan., is one of the projects now being planned in the office of CHARLES A. HASKINS, 822 Finance Bldg., Kansas City, Mo. Other works on which he is preparing reports or plans include an additional water supply for Norton, Kans., a new franchise and water rates for Great Bend, Kans., repairs and extensions to the sewage treatment plant at Smith Center, Kans., and improvements to the water works at Medicine Lodge, Kans.

Street improvements in Medicine Lodge, Oakley, Scott City, and Smith Center, Kans., and Elvins and Bonne Terre, Mo., are among the projects now being constructed under the supervision of this company. Other work which Mr. Haskins is supervising are a sewerage and water works extension for Farmington, Mo., a sewage treatment plant at Topeka, Kans., a water works and sewer system at Troy, Kans., and extensions to the sewer system of Flat River, Mo.

Consulting Briefs

Russell Thayer, Consulting Engineer, Packard Bldg., Philadelphia, Penna., reports that he is now engaged in engineering work on the Delaware River Vehicular Tunnel, South Philadelphia; a double track, one-way traffic express highway from Camden to Atlantic City, N. J.; and the New Jersey Sea Level Ship Canal, connecting the Delaware River with New York Bay and the City of New York.

Clark & Pike Co., Willoughby, Ohio, reports that the firm is now engaged on plans for modern burial parks at Columbus, Ashtabula, Warren and New Philadelphia, Ohio; Rockford, Ill., and Buffalo, N. Y. Grading, sewer and road construction and landscape gardening are already under way in the above locations.

Howard E. Simpson, Consulting Water Geologist, University Station, Grand Forks, N. D., is State Water Geologist for North Dakota. He is at present working on plans for an additional water supply for the city of Regina, Canada.

Howard E. Simpson

McCrary, Culley & Carhart, 900 Exchange Bldg., Denver, Colo., are now working on a city plan for Denver, Colo., and on zoning plans for the cities of Fort Collins and Sterling, Colo., as well as campus plans for the University of Denver and for the University of Colorado and a park for Ogden, Utah.

L. Segoe, Consulting Engineer and City Planner, 1107 Traction Bldg., Cincinnati, Ohio, is now working on comprehensive city and regional plans and zoning ordinances for Lexington, Ky., Covington, Ky., Middletown, Ohio, and Hamilton County, Ohio; zoning ordinances for Reading, Milford, Silverton, and Deer Park, Ohio, and is acting as City Planning Consultant on the Cincinnati Union Terminal Project. E. A. Kraemer, who acts as Resident Engineer for Mr. Segoe, has recently joined the staff.

R. Husselman, Consulting Engineer, 688 Union Trust Bldg., Cleveland, Ohio, is at present working on reports for Ellwood City, Penna., Middlesboro, Ky., and Hicksville, Ohio. He recently acted as expert witness for the Public Service Commission of Indiana in the Insull merger case before the Commission.

McClendon & Purnell, Consulting Engineers, Corsicana, Texas, are at present engaged in preparing plans for a $5,000,000 road program for Navarro County, Texas.

L. J. Jordan, 1240 Harding Place, Charlotte, N. C., is at present supervising the construction of a plant for the Standard Oil Co. of New Jersey at Columbia, S. C., the project consisting of an office building, garage, warehouse, bulk plant and miscellaneous structures.

Burrell Engineering & Construction Co., 2165 Daily News Bldg., Chicago, Ill., report that they are at present supervising the construction of a 3,000,000-bushel grain storehouse in Superior, Wis., for the Great Northern Railway; a storage and pack house in Des Moines, Iowa, for the Penn-Dixie Cement Co.; a truck loading pack house in Manitowoc, Wis., for the Medusa Cement Co., and a storage and pack house in Jamesville, N. Y., for the Alpha Portland Cement Co.

W. W. Jourdin & Co., Inc., 175 Fifth Ave., New York, N. Y., is now supervising the construction of a boiler plant for the Inspiration Consolidated Copper Co., Inspiration, Ariz.; a new power plant extension for the Greene-Cananea Copper Co., Cananea, Mexico, and a new power plant for the Calumet & Arizona Mining Co., Lowell, Ariz.

Carl E. Grunsky, Consulting Engineer, 57 Post St., San Francisco, Calif., Past President of the American Society of Civil Engineers, was elected President of the American Engineering Council at the opening session at the annual meeting of the Council held in Washington in January. Mr. Grunsky, who will serve during 1930 and 1931, succeeds Arthur W. Berresford of New York, Past President of the American Institute of Electrical Engineers.

Maurice A. Reidy, 44 School Street, Boston, Mass., is now working on reports and plans for a 14-story bank and office building, an 8-story fire-proof apartment building and a sub-station for the Edison Electric Illuminating Co., all located in Boston. He is also supervising the construction of a 24-story office building, Boston; a bank building, Newport and a bank building in Woonsocket, R. I.

John Nolen, Harvard Square, Cambridge, Mass., is engaged in preparing comprehensive city plans and reports for Sharon, Penna., and Little Rock, Ark.; plans for the subdivision of a new annexation for the Borough of Wyomissing, Penna., and plans for a report on the revision of the town plan for Spartanburg, S. C., and Clewiston, Fla. The construction of the Walpole Memorial Park and Recreation Pond in Walpole, Mass., is being carried on under his supervision.

Jacob L. Crane, Jr., 916 Wrigley Bldg., Chicago, Ill., is engaged in preparing plans for the cities of Kalamazoo, Mich., Aurora, Ill.; La Grange and Western Springs, Ill.; Medford, Ore.; Highland Park, Ill.; Hammond, Ind., and for four parks in Janesville, Wis. He is also supervising the street and similar improvements on "The Grove" land subdivision, Peru, Ill.

H. G. Olmsted, El Paso, Texas, is engaged in the preparation of plans for a sanitary sewer system for Goliad, Texas; an airport and municipal golf course, a 60-foot span concrete bridge over Alpine Creek, and plans for a park for Alpine, Texas. A water works extension and street paving project for Goliad and a street paving project for Alpine is now being carried on under Mr. Olmsted's supervision. J. D. Harris, Resident Engineer, and E. C. Perez, Designing Engineer, have recently joined Mr. Olmsted's staff.

John Stewart Engineering Service

A REPORT from Colonel John Stewart, formerly a member of Black, McKenney & Stewart, consulting engineers, now dissolved, states that he will engage in the practice of consulting engineering under the name of the JOHN STEWART ENGINEERING SERVICE. Colonel Stewart's work will include consultation, research, investigation, reports, plans, estimates, representation, and supervision of river and harbor projects, port and terminal works, industrial, commercial and municipal projects, highways and foundations. His offices are located at 1653 Pennsylvania, Ave., N. W., Washington, D. C.

Colonel John Stewart

Building Construction In and Around New York City

CONSTRUCTION on a ten-story warehouse and loft building at 250 West 37th St., New York, is being supervised by JACOB FELD, 103 Park Ave., New York, who is also working on an 8-story garage on West 12th St., New York, and a 6-story bank and office building at Jamaica, L. I.

This organization is also preparing plans for a 10-story hotel at Coney Island, N. Y., and the McCann warehouse in Yonkers, N. Y. Other projects for which plans are being completed and on which construction has already begun include two earth dams at Martins Lakes, Port Jervis, N. Y., an office building at 80-86 Nassau St., New York, and a prize fight arena at Miami, Fla., which is to be known as the Miami Madison Square Garden.

They have also been called upon to give expert testimony in the cases of the Ready Mixed Concrete Corp. vs. Commonwealth Engineering Co.; Wolkinson, et al., vs. Lippe Contracting Co., et al.; and Fogelson vs. sewer contractors in Rockaway, N. Y.

Reports on Water Supplies and Sewerage Systems

IN a recent report John C. Bradley, Vice-President, ROBERT O. BRADLEY & Co., 500 Chickasha Ave., Chickasha, Okla., states that James D. DuBose, Henry G. White and Given H. Dugger have recently joined the staff of the Bradley Co.

This organization now has reports in preparation on a water supply project at Chickasha, a sanitation and sewage disposal project at Blanchard, Okla., a sewage disposal plant at Anadarko, Okla., and a storm sewer and a drainage system at Lawton, Okla.

They are supervising a paving program at Chickasha, water and sewer extensions at Anadarko, water extensions and an increased water supply at Blanchard, and a paving program at Lone Wolf and Rocky, Okla.

Cases in which they have been called upon for expert testimony include the City of Chickasha, Okla., vs. the C. R. I. & P. Railway Co.; Melton & Melton vs. City of Snyder, Okla.; and the City of Duncan vs. the American First National Bank of Oklahoma City.

Plans for Various Projects Under Way By Duluth Engineer

PLANS for a number of projects, including power, lighting and generating plants, are now being prepared by CHARLES FOSTER, Consulting Engineer, 512 Sellwood Building, Duluth, Minn. They are a service building for Nopeming Sanitorium, Nopeming, Minn.; electric wiring on schools, Superior, Wis.; additions to the municipal light plant, Watertown, S. D. and a generating unit for Denfeld High School, Duluth. Mr. Foster is also supervising the construction of the municipal power plant, Watertown, S. D., a water filtration plant, New Ulm, Minn.; additions to the municipal power plant, Fairmont, Minn.; mechanical equipment for the Junior High School, Duluth, Minn. and for the City Hall, Ely, Minn.

Waterworks and Sewage Disposal Plants Planned By Texas Engineers

AMONG the projects which MONTGOMERY & WARD, Consulting Engineers, 545 Harvey-Snider Bldg., Wichita Falls, Texas are now working, are the appraisal of an electric service system and waterworks for Yoakum, Texas; a water supply report for Pecos, Texas; a municipal park for Plainview, Texas, and a sewage disposal plant for Iowa Park, Texas. Other projects, the construction of which is being carried on under the supervision of this firm, are paving and sanitary sewers, Midland, Texas; paving at Brownfield, Hale Center and Grand Saline, Texas; a waterworks system at Dimmitt, Texas, and waterworks and sanitary sewer improvements at Levelland, Texas.

Street Improvements and Sewer Construction in Austin, Texas

A RECENT report from H. R. F. HELLAND, Consulting Engineer, 303 Frost Bank Bldg., San Antonio, Texas, states that bids were received on March 13 for the city of Austin, Texas on approximately 13 miles of sanitary sewers ranging in size from 6 to 15 inches and 3 miles of storm sewer ranging in size from 15 to 108 x 65-inch concrete box. The approximate cost of this work, which will be done under Mr. Helland's supervision, will be $75,000 and $85,000 respectively.

On March 20 bids were received on approximately 155,000 square yards of paving. This is the first work to be let under $175,000 bonds for sanitary sewers and $600,000 bonds for street improvement which the city sold this year. All of this is part of an issue of $550,000 for sanitary sewers and $2,000,000 for street improvement voted by Austin in 1928. The entire work is to be spread over a period of five years.

Work already completed under bonds previously issued includes 136,642 feet of sanitary sewers, 6 to 30 inches, at a cost of $233,701.93; 101,146 feet of storm sewers, 15 inches to 7 feet x 8 foot 6-inch box, at a cost of $440,987.80; 198,600 square yards of paving at a cost of $462,217.41 and five small bridges and culverts, costing $17,000.

In addition to the sanitary and storm sewers, Mr. Helland's contemplated work for this year includes 18 miles of street paving and seven bridges and concrete culverts.

Plans for Flood Control Projects

PLANS are being prepared by the CLARK E. JACOBY ENGINEERING CO., 700 Interstate Bldg., Kansas City, Mo., and 650 East Big Bend, St. Louis, Mo., for a flood control project at Great Bend, Kans., known as the Cheyenne Bottoms Project; the Missouri Valley Flood Control Project, located north of St. Joseph in Holt County, Mo., sewer projects in St. Louis County, Mo., and two conservancy projects in Oklahoma.

This firm has been called upon recently for expert testimony in several cases involving disputes as to plans and assessments in connection with flood control projects between property owners, districts and railroads.

W. L. Picton, of Memphis, Tenn., Associate Member, Am. Soc. C. E., has recently joined the Clark E. Jacoby Engineering staff. Mr. Picton is a specialist in hydraulic engineering, flood control, sewers and waterworks.

Seventeen Sewerage Systems and Treatment Plants Under Design

A REPORT of W. De Witt Vosbury of REMINGTON, VOSBURY & GOFF, 509 Cooper St., Camden, N. J., states that his firm has under design at present seventeen sanitary sewerage systems and sewage treatment plants, two trunk sewers, several water works projects and other work, the total estimated value of which is $15,000,000. They are also preparing sanitary surveys and reports for the Raritan River Drainage District in New Jersey and for the Metropolitan District of Camden County, N. J.

Among the sanitary sewers and sewage treatment plants now under construction under the supervision of this organization are those for Reading, Pa., Cape May, N. J., Atlantic Highlands, N. J., West Chester, Pa., Barrington, N. J., Collingswood, N. J., New Castle, Del., Asbury Park, N. J., Stone Harbor, N. J., and Palm Beach, Fla. They are also supervising the construction of a water works for Haddonfield, N. J. The estimated cost of work under way is approximately $12,000,000.

A Variety of Projects Under Way by Kansas City Engineers

PLANS are now being prepared by the Burns-McDonnell Engineering Co., 406 Interstate Bldg., Kansas City, Mo., for the rehabilitation of a light and power plant for Kansas City, Kans.; a new boiler house for Springfield, Ill.; a report on a sewage disposal plant for Palo Alto, Calif., and Stanford University; a large lake and dam, Springfield, Ill.; a report on a dam and impounded water supply for Fort Smith, Ark.; sewers in Kewanee, Ill.; a report on new water supply for Lincoln, Nebr.; a new power and light plant for Jackson, Tenn., and a report on one for Northfield, Minn.; a sewage disposal plant for Carroll, Iowa; an appraisal and rate study for Amarillo, Texas; municipal power and light plant for Augusta, Ga.; appraisal of the water system for Paducah, Ky., and a number of other smaller jobs.

Construction going on under the supervision of this firm includes a large flow line of 36-42 inches in diameter and 6 miles long for Kansas City, Kans.; power plant equipment for the University of Nebraska, Columbia, Mo., Muscatine, Iowa, and Winterset, Iowa; a new filter plant for Iola, Kans.; a water system at Osceola, Mo., and water supply for Thermopolis, Wyo.

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The Editor Comments —

Make *Your* Job Safe

Two weeks ago I visited a bridge job where a novel concreting plant had been built up. It happened that after making about one-third of a pour of a monolithic bridge slab, the power plant gave out and three men spent nearly two hours tinkering with the gasoline engine. About 12 feet above the ground at a point where the slope was sharply away from the plant one of the three men moved toward the edge, tripped and pitched headlong toward the ground. He turned just enough in those 12 feet to strike on his back. He had the wind knocked out of him and wrenched his back rather badly. Lucky? Yes. He struck within 6 inches of a pointed rock that might easily have broken his arm, back or neck. What caused the trouble? The man was careless. Yes, but the contractor was more careless in not spending a dollar for a rail around the top platform to prevent just such accidents.

It is a wonder there are not more accidents at batcher plants where two or three or four men are walking back and forth on a platform 10 to 15 feet above the ground. Some of these batching plants have substantial floors, but few have any rails around the outside of the plant to prevent an accident and I have yet to see one with stairs and a handrail instead of the usual ladder. If you have stairs on your batching plant, send me a photograph of it and I shall be glad to publish it.

Construction has a bad name in the safety first movement. Let's give a few minutes thought to "Save an Accident."

Does Clean Equipment Help Profits?

Two of the New Jersey State Highway jobs I have visited within 10 days impressed me particularly because the trucks, pavers, finishing machines and, in fact, everything, was clean. When you think of it, most contractors are like little fellows who hate to wash behind their ears and below the collar line, and it just doesn't pay.

One of these contractors has been in business over twenty years and the other nearly as long. It is a hobby with the older organization that every piece of equipment, as well as its material yard, shall be just as spic and span as the living room at home. Pavers are oiled before they are used, so that the concrete, cement dust and fine stone dust won't stick badly and what does adhere can be quickly wiped off. When you see the trucks of these organizations coming down the road you think at once that they are all new, but instead they are just cleaned every night. Each operator cleans his truck and then a mechanic goes over the equipment to be sure it is all right to go on the job the next morning.

One of these contractors operates a ready-mixed concrete plant, which I am going to tell you something about in a later issue of CONTRACTORS AND ENGINEERS MONTHLY. The plant has been in operation 18 months with one man handling the mixer from the day the plant was started. He is proud of the fact that he takes 30 minutes every night to wash out the mixer and to clean the outside.

Both of these contracting organizations are making good progress because their equipment is looked after. Every operator who is taught to keep his equipment clean, instinctively takes better care of the equipment at all times. Thus the equipment lasts longer, is not laid up with breakdowns and the profits keep coming in. One rival contractor told me that, of course, these people could keep their equipment clean because they paid better wages than the rest of the contractors in that section. That is nonsense, because when you come to think of it, both of these contractors can bid on the same jobs and, if the senior contractor can pay his men better wages, he has to take it out of his competitive profits which the other man is very probably doing his best to cut.

Did you ever stop to consider the advertising value of clean equipment? It means that when you once have your name painted on a piece of equipment, it is going to be seen by everybody at all times and not be covered up with mud, concrete, plaster or "what have you" 90 per cent of the time. Think it over. I believe clean equipment is good sense.

Bad Practice with Dynamite

You can't play with fire and always get away with it and you can't fool with dynamite, either. There is one process which seems to be quite general among handlers of dynamite that should be squelched by every construction superintendent.

In putting the explosive into holes 10 to 20 feet deep, sometimes the dynamite catches on the sides of the hole and during the tamping the explosive will flatten out and reduce the diameter of the hole. This is just the opportunity that Old Man Carelessness is looking for. The Pats and the Tonies that load the holes have found that drill steel slowly pushed down the hole will clean off the explosive adhering to the side, BUT, it is very easy to make a spark and up shoots the steel, skinning the tamper's hands and the gases that follow burn the flesh. In one case mentioned in a discussion of this problem, two men working fully 15 feet away were injured, one by flying rock and the other, who was standing with one foot on either side of a crack produced by a legitimate blast, had his ankle and leg broken by the 2-foot upheaval of the rock on the side nearer the hole.

DON'T TAMP WITH DRILL STEEL.

Theodore Reed Kendall

Construction Industry News

Universal Atlas Cement Co. and **Atlas Lumnite Cement Co.**, New York, have announced the removal of their offices to the Chrysler Building, 135 East 42nd St. Atlas formerly maintained offices at 25 Broadway and 41 East 42nd St., while the Universal office was at 30 Church St.

American Manganese Steel Co., Chicago Heights, Ill., has announced the election of A. W. Daniels as Vice President in charge of Sales. Mr. Daniels joined the company in 1920 as Chicago Office Manager and two years later became Central Sales Manager. In 1923 he was appointed General Sales Manager, which position he occupied until the present time.

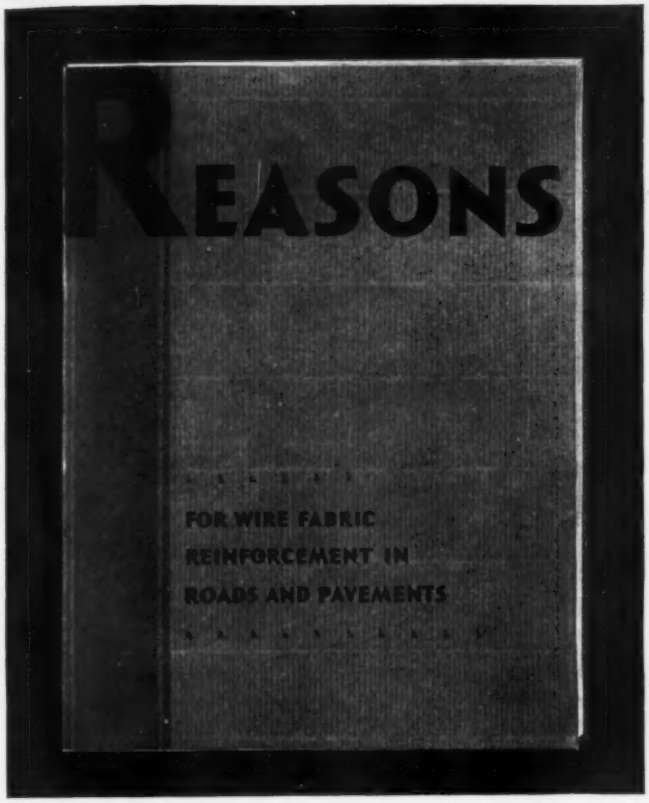
Manitowoc Engineering Works, Manitowoc, Wis., has appointed the following new distributors for Moore Speedcranes, shovels, draglines and trenchoes: Edgerton & Sons Co., 585 Hosatonic Ave., Bridgeport, Conn.; Hudson Valley Welding Co., 7 Buckingham Ave., Poughkeepsie, N. Y.; W. A. Ward, Hillsdale, N. Y.; James Beales, Jr., Box 445, Sound Beach, Conn.; Ilium Truck & Equipment Co., Inc., 2 Oakwood Ave., Troy, N. Y.; Contractors Machinery Co., Kansas City, Mo.; J. B. Harbison Equipment Co., Little Rock, Ark.; Northfield Iron Co., Northfield, Minn.; J. C. McDonald, 2104 Webster St., Omaha, Nebr.; Contractors Machinery & Supply Co., 318-320 Penn Ave., Pittsburgh, Penna.; La Lance Equipment Co., Huntington, West Va.; Richmond Machinery Co., Richmond, Va.; J. W. Hodge, 1334 No. Highland Ave., Atlanta, Ga.; Harvard Turnbull & Co., Excelsior Life Bldg., Toronto, Ont., Canada.

Ingalls Iron Works Co., Birmingham, Ala., recently purchased the plants of the Bollinger-Andrews Construction Co., and the Pennsylvania Fabrication Co., Verona, Penna., in the Pittsburgh district. These plants are being extensively improved and new and modern machinery is being added.

1930 *OFFICIALS OF THE ASSOCIATED EQUIPMENT DISTRIBUTORS*

Top row, left to right: A. C. Blaisdell, Secy., A. E. D., Secy., Queen City Supply Co., Cincinnati, O.; Dan R. Brown, Director, A. E. D., Pres., Brown-Bevis Co., San Francisco, Calif.; Mark Kaplan, Director, A. E. D., Sales Mgr., Superior Supply Co., Chicago, Ill.; H. W. Fletcher, Treas., A. E. D., Treas. and Gen. Mgr., Clyde Co., New Orleans, La.; Center row: Oscar B. Bjorge, 2nd Vice. Pres., A. E. D., Mgr., Clyde Equipment Co., Portland, Ore.; A. A. Fuchs, Pres., A. E. D., Vice Pres., Fuchs Equipment Co., Omaha, Nebr.; N. Floyd Jr., 1st Vice Pres., A. E. D., Treas., Hubbard-Floyd Co., Inc., New York. Bottom row: Carl Borchert, Director, A. E. D., Pres., Borchert-Ingersoll, Inc., St. Paul, Minn.; E. K. Hurst, Director, A. E. D., Pres. and Gen. Mgr., Western Material Co., Sioux Falls, S. D.; M. R. Hunter, Director, A. E. D., Pres., Hunter Machinery Cos., Detroit and Grand Rapids, Mich. and Milwaukee, Wis.; T. W. Rosholt, Director, A. E. D., Pres., T. W. Rosholt Co., Minneopolis, Minn. Victor L. Phillips, Pres., Victor L. Phillips Co., Kansas City., is also a Director of A. E. D.

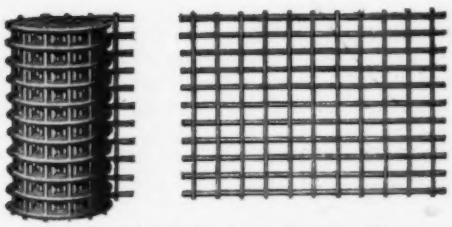
BY EMINENT HIGHWAY AUTHORITIES



▸▸▸ ONE REASON IS

"Wire Fabric Reinforcement prevents the development of microscopic cracks into visible cracks, by reason of small members, closely spaced."

—Excerpt from page nine of "Reasons"



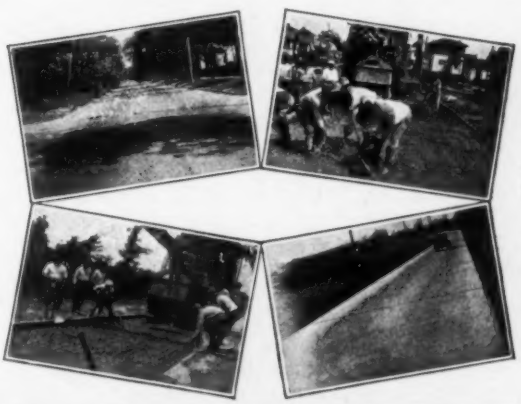
Electric Welded Mesh—In Rolls or Sheets

Nine More Reasons are Outlined in this Booklet ▸▸▸

THE country's most renowned authorities on highways are contributors to the pages of this book. Clearly and logically they explain why wire fabric should be used in all concrete roads and pavements and in the concrete base of other types of surfaces.

With this data in your files, you will have constantly available valuable information, that outlines the merits of wire fabric reinforcement. The facts are authentic and based on years of actual experience.

A copy of "Reasons" is yours for the asking—and you will not be obligated. Just address any of our sales offices which are listed below.



AMERICAN STEEL & WIRE COMPANY

SUBSIDIARY UNITED STATES STEEL CORPORATION

208 S. La Salle Street, Chicago — 30 Church Street, New York

Other Sales Offices: Atlanta Baltimore Birmingham Boston Buffalo Cincinnati Cleveland Dallas Denver Detroit Kansas City Memphis Milwaukee Minneapolis-St. Paul Oklahoma City Philadelphia Pittsburgh Salt Lake City St. Louis Wilkes-Barre Worcester

U. S. Steel Products Co.: San Francisco Los Angeles Portland Seattle Honolulu

Export Distributors: United States Steel Products Co., 30 Church St., New York City

The executive office will remain at Birmingham. The Ingalls Iron Works manufactures structural steel, Ingalls steel joists, steel storage tanks and steel plate for construction of any type.

Chain Belt Co., Milwaukee, Wis., has appointed the J. D. Adams Manufacturing Co., Indianapolis, Ind., as exclusive distributor in the Indianapolis territory for the Rex Champion paver and Rex road pump. Another recent appointment is that of R. B. Everett Co., Houston, Texas, as distributor of the complete line of Rex construction equipment.

The New York office of Chain Belt has moved from 50 Church St. to the new Chrysler Building, 405 Lexington Ave., New York.

Alexander Milburn Co., Baltimore, Md., has announced that Charles R. Pollard, formerly associated with the Baltimore office, has been appointed Chicago District Representative, with offices at 220 South State Street, Chicago, Ill.

International Derrick & Equipment Co., Columbus, Ohio, has announced the purchase of the Leidecker Tool Co., Marietta, Ohio, manufacturers of drilling tools and similar equipment. This company will continue to operate under its former name, with the plant remaining in Marietta and the present organization retained intact.

The Paradon Mfg. Co., Arlington, N. J., has announced the appointment of Gerald Standish as its representative to handle the sales and service of Paradon chlorinators in the states of Minnesota, North Dakota, South Dakota and Northern Wisconsin. Mr. Standish was formerly in the Sales Department at the main office of the company and, prior to that time, was engaged in service engineering work from the main office. He will be located in Minneapolis.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has moved its Chicago office to 20 North Wacker Drive, Chicago, Ill.

W-K-M Co., Inc., Houston, Texas, has recently announced the appointment of Alexander J. Duaei as Manager of Sales, for the Western Territory with offices at 205 West Wacker Drive, Chicago. Prior to joining the W-K-M Co., Mr. Duaei was for eleven years connected with the Johns-Manville Co., seven years of which he was Manager of the Public Utilities Division of that organization.

Eisemann Magneto Corp., New York, has moved its executive and sales offices from 165 Broadway to the new Lincoln Building, 60 East 42nd Street, New York.

H. D. Conkey & Co., Mendota, Ill., has changed the name of its manufacturing division to the Conco Crane & Engineering Works, Division of H. D. Conkey & Co., Mendota, Ill.

Link-Belt Co., 910 South Michigan Ave., Chicago, Ill., has announced the appointment of three new distributors to handle the complete line of crawler cranes, shovels, draglines, and locomotive cranes: P. L. Tippett, Rhodes Bldg., Atlanta, Ga.; Jos. C. Fiorello Co., Larkin Terminal Bldg., Buffalo, N. Y.; and Bacon-Hibbard-Eichman, Inc., 917 Central Ave., Cleveland, Ohio.

The Baltimore office of the Link-Belt Co. has moved to 913 Lexington Building. H. D. Alexander is in charge.

Trackson Co., Milwaukee, Wis., has recently appointed the Edward R. Bacon Co., San Francisco, Calif., as distributor for Trackson tractor equipment in the San Francisco territory.

G. H. Williams Co., Erie, Penna., has appointed the following distributors to represent it in their respective territories: Stuart M. Christhilf & Co., Baltimore, Md.; S. G. Hawkins, Houston, Texas; Stein & Ainlay, Cleveland, Ohio; Kratz & McClelland, San Francisco, Calif.; all of whom will handle clamshell buckets and trailers; and the following who will handle trailers only; Allegheny Equipment Corp., Pittsburgh, Penna.; Hedge & Mattheis Co., Boston, Mass.; Chester A. Phillips, Chicago, Ill.; Phillips & West Co., Brooklyn, N. Y.; Johnson & Dealaman, Newark, N. J.

Morris Machine Works has announced the removal of its New York office on May 1, 1930, to the Pennsylvania Building at 225 West 34th St., New York.

DeWalt Products Corp., Lancaster, Penna., manufacturers of electrical equipment for cutting wood, stone and metal, has announced the acquisition of the Wodack electric hand saw and also the Wodack electric combination mortiser and router, which from now on will be manufactured by DeWalt and distributed through a national sales organization.

Dobbie Foundry & Machine Co., Niagara Falls, N. Y., has recently appointed Brown & Sites Co., Inc., 30 Church St., New York, as the New York Representatives for the complete line of Dobbie sheaves, winches and derrick fittings.

C. F. Pease Co., Chicago, Ill., has announced the appointment of C. D. McCormick, formerly Assistant Advertising Manager, to the position of Advertising Manager to succeed W. Earle Pashley who is now Second Vice President and Assistant Sales Manager.

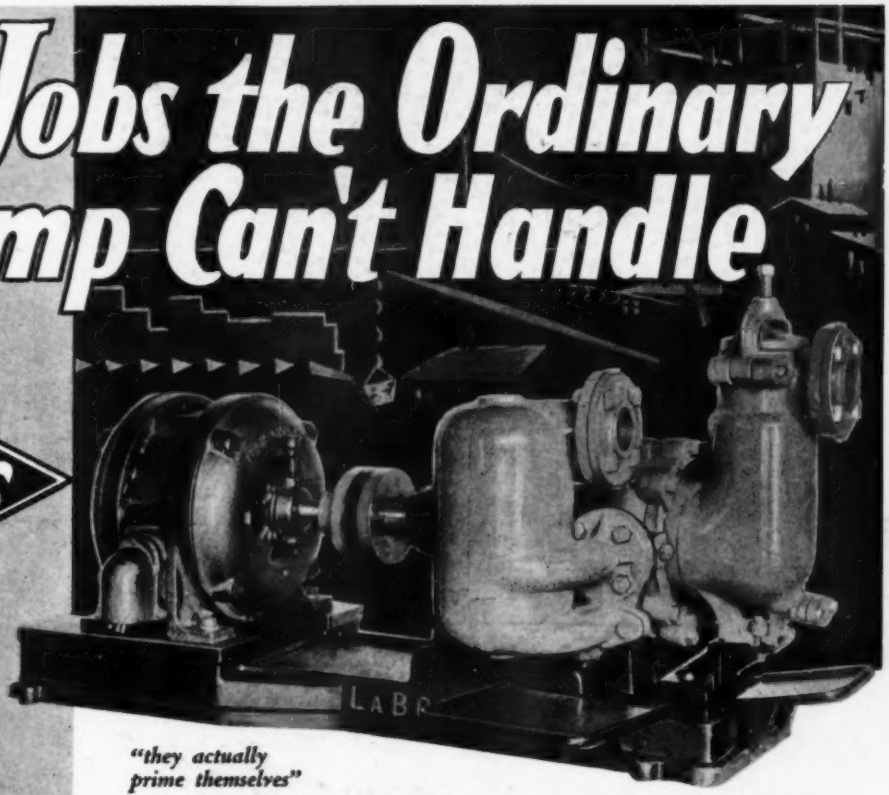
A Highway Equipment Exposition Next October

THE Permanent International Association of Road Congresses is to meet for the first time in the United States on October 7, 8, 9 and 10, 1930. This Sixth Congress will be attended by government officials and special delegates from 56 countries throughout the world. In connection with this the American Road Builders Association is planning to hold an exposition of highway equipment and materials in the Washington, D. C., Auditorium with outdoor space adjacent to the Auditorium available for large pieces of equipment and special demonstration grounds where the road building equipment may be shown in operation. An invitation has been issued manufacturers of highway equipment and materials of all countries which will give this exhibit a distinctly international flavor.

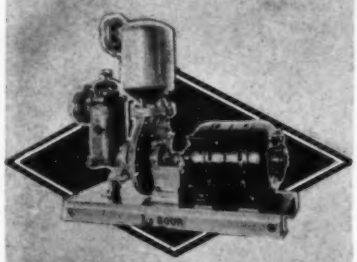
Excavating Unusually Soggy Earth on a Real Estate Development on the Outskirts of Cleveland. A Model 30 Cletrac Is Shown with an Essex Hydraulic Bulldozer

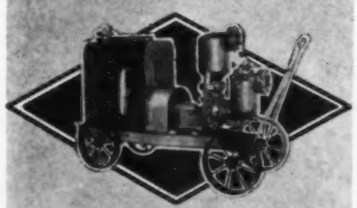
for Jobs the Ordinary Pump Can't Handle

LaBour



"they actually prime themselves"





SHEER ability to exhaust air from empty suction lines and to lift water from points 20 feet or more below the surface, without the use of priming tanks, valves, air pumps or other auxiliaries---this is what puts a LaBour Self-priming Centrifugal Pump ahead of ordinary pumps.

Install a LaBour Pump on any water removal job and dismiss it from your mind. Regardless of conditions at the well point---whether water seepage be continuous or intermittent---LaBour Pumps stay primed and take the water as it comes.

Such performance is possible only with a LaBour.

There is only one moving part---the impeller---and ample clearances within the pump casing permit handling of dirty water without clogging. Ruggedly constructed LaBour Self-priming Pumps are offered in capacities up to 1,000 gallons a minute, in either portable or stationary installations.

Write for Bulletin

The LABOUR COMPANY, Inc.

ELKHART, INDIANA

LA BOUR PUMPS

NEVER LAY DOWN ON THE JOB

The Smith-Insley Paver Tower Unit Used in Pouring the Concrete

Paver with Hinged Tower Moves Along the Forms in Grade Elimination Job

GRADE elimination work for the Long Island Railroad from Far Rockaway into the Pennsylvania Station, New York, involved a steady concrete pour over a long narrow area. The job called for retaining walls 29 feet high with expansion joints every 30 feet. About 150 to 160 cubic yards of concrete were required for each section.

Mixing the concrete in a standard mixer and carting it to the forms was considered impractical as well as costly. Equipment had to be selected that would move quickly along the forms and at the same time, chute the concrete where it was wanted.

A Smith-Insley paver tower unit, a product of the National Equipment Corp., was chosen for this work. It consists of a standard Smith 27-E paver with boom and bucket removed and a 53-foot 4-inch Insley tower mounted at the discharge end. A 54-foot receiving hopper delivers the concrete on a 20 and 10-foot chute section. All operations are controlled by centralized levers on the paver platform. The A-frame construction and low center of gravity of the standard Smith paver, make it particularly adaptable for supporting such heavy placing equipment. The tower is hinged directly above the paver frame so that it can be folded back on top of the paver when moving to other jobs.

A Smith-Insley paver tower unit is also being used for pouring concrete piles at Rockaway—another part of the Long Island Railroad project. The piles are intended for a boardwalk and have to be precast with concrete beams capping them. Each beam requires 8 cubic yards of concrete. Consequently every 8 yards it is necessary to move the combined mixing and placing unit.

The paver tower equipment can be changed back to a standard paver for road work by merely removing the tower and adding the boom and bucket. The tower placing unit can also be used independently by merely adding a hoist. It is said that these changes can easily and swiftly be made in the field whenever it is necessary.

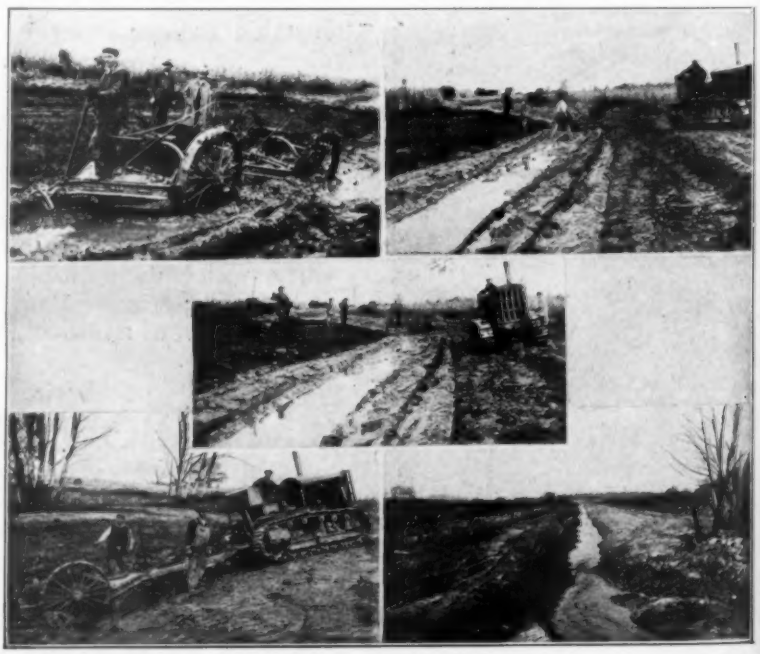
Smith-Insley paver tower units have also been used extensively on large sewer work, sea-wall construction and other concrete structures spread out over big areas. It is reported that similar equipment completed the $1,000,000 Buffalo Pier a year ahead of schedule.

Cost of Ditch Relocation Cut by Use of Scoops in Ohio

BROKENSWORD ditch, a meandering little stream in central Ohio, was causing the State Highway Department much trouble due to overflowing and damaging State Route 98. In cooperation with the farmers who were suffering damages from the overflow, the State Highway Department undertook a relocation project to provide a better channel for the stream.

A new channel ¾-mile long, 50 feet wide at the top, 6 feet wide at the bottom and 10 feet deep was cut with scoops and tractors. Extreme working conditions were encountered including everything from stiff blue clay to quicksand. Warco scoops were used and were operated in the mud by two tractors and a cable.

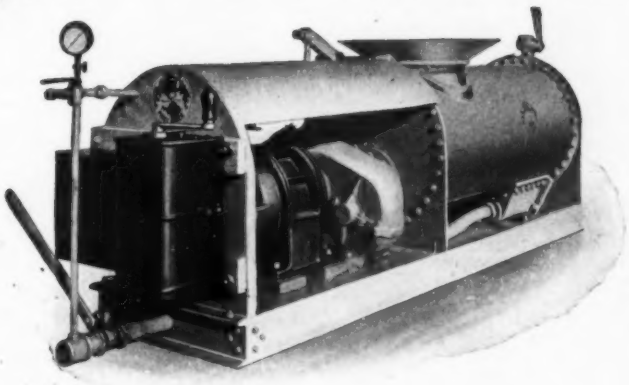
Records of costs show that the work was accomplished for about $2,000 less than the contract estimate. V. I. Walker, of the State Highway Department, was in charge of this unusual work.



The Warco Scoops Operated in the Mud by Two Tractors and a Cable. Dumping Was Accomplished by Towing with One Tractor. The Lower Left-Hand Picture Shows a Scoop with a Tongue at Work. The Illustration on the Right Shows the Finished Ditch

Ransome

PNEUMATIC CONCRETE PLACERS



For placing concrete in difficult and inaccessible places, the Ransome Pneumatic Placer effects great savings in time and money. It gives a stronger, denser concrete.

Over 2,500,000 cubic yards of concrete have been placed by these machines. Not only in the United States but in Canada, Scotland, Italy, Switzerland, Japan, India, Chile, Brazil, Argentine, Mexico and other countries these placers can be found today —placing concrete quickly and economically.

Detailed information for use on specific jobs will be sent upon receipt of answers to the following questions:

1. Length of tunnel, end to end.....
2. Length between shafts.....
3. Height and width in rough.....
4. Height and width, finished section.....
5. Minimum thickness of concrete and point at which it is found.....
6. Amount and location of reinforcing.....
7. Is tunnel in rock or earth?.....
8. Will tunnel excavation be completed before lining?.....
9. If mucking, while lining, must muck cars pass through forms?.....
10. If in soft ground, will concreting follow up behind heading?..... Estimated distances.....
11. Length of form used, steel or wood, and print of same.....
12. Type of concrete cars. Height and width.....
13. Locomotives (if used). Height and width.....
14. Size and kind of gravel or stone used.....
15. Compressed air available in cubic feet per minute.....
16. Will drills, air hammers, etc., operate from this supply when blowing concrete?.....
17. Gauge and size of track used.....
18. Electric current available for operating 7½ hp. motor.....
19. How much yardage to be placed by air is involved?.....
20. Make sketch showing measurements mentioned in 3, 4, 5 and 6.

RANSOME PNEUMATIC GROUT MIXER AND PLACER

For sealing fissures, rifts, etc., in tunnel work and checking the flow of water, pneumatic grouting is proving the most convenient and inexpensive method. The opening is closed by any ordinary means except at the points where the discharge line from the grout mixer is inserted. At these points grout is forced in under sufficient pressure to overcome the head and allowed to set up when the opening is closed permanently, and the work can proceed without further interruption.

Pneumatic Grouting by means of the Ransome Pneumatic Grout Mixer and Placer is an exceedingly simple operation. As an air compressor is usually available, the cost of the equipment is very small.

Ransome Concrete Machinery Company

Dunellen 1850—Service for 80 Years—1930 **New Jersey**

Labor Saving Crawler Truck and Gravel Loader

A CRAWLER type loader built particularly for the handling of sand, gravel and stone in large quantities has been developed by the New England Road Machinery Co., South Boston, Mass. This machine, which is simple and strong, requires the services of only one man and consumes a reasonable quantity of gasoline and lubricating oil. An extra heavy rugged chain operates the bucket to permit heavy loading without undue wear. The elevator can be lowered for transportation or for passage through low overhead entrances. The height of the loader in working position is 16 feet 6 inches and it is 19 feet long. When lowered for transportation the loader measures 12 feet 5 inches high and 22 feet long. A pair of 2-inch adjusting screws permit the raising and lowering of the elevator easily and quickly by the turning of a hand wheel within convenient reach of the operator's platform.

The New England Crawler Truck and Gravel Loader

The machine has three speeds forward and one in reverse. The forward speeds range from 16 feet to 77 feet per minute while the feeding speed is approximately 13 feet per minute. The elevator and crawler work independently of each other. It is, therefore, possible to stop the elevator while moving or keep it working while crowding into the material to be loaded.

The crawler tread provides a firm foundation while moving over sand or other soft materials. The crawler pads are 12 inches wide, simple in construction and unusually rugged, being made of alloy steel, self-cleaning in design and driven by a specially designed sprocket. The loader has a positive feeding device in the form of a continuous screw which forces wet or dry material into the bucket.

The machine is equipped with large smooth-engaging and positive-releasing internal expanding band friction clutches for all motions. The release clutch at the top of the elevator prevents accident or breakage by releasing the elevator and causing it to stop if the buckets or feeding arrangement come in contact with a ledge or other solid object. Upon moving the machine away from the object or, if possible, moving the object itself, the loader automatically starts working without any adjustment being necessary. The adjustable loading chute which is a feature of this machine can be raised or lowered from the operator's platform and can be locked in position. As the chute is attached on a swivel base, it can also be swung around on either side to make any angle, making it easy to load any kind or size of truck even under unfavorable loading conditions.

A New Truck Body for Carrying Ready-Mixed Concrete

Delivering Concrete at Low Cost

DESIGNED and built by contractors to speed up and improve the laying of concrete from a central mixing station, the Parke Concrete Carrier, made by Parke Concrete Carrier, Inc., 7 Dey St., New York, is made to carry any capacities up to 5 cubic yards and is adaptable to any standard chassis.

Because gravity will unload the cone from its normal position when the door is opened, no hoist is needed, permitting operation and dumping wherever the truck can enter. The elimination of agitating blades or mechanism from the interior of the drum reduces cleaning. All that is necessary to clean the carrier is to partly fill it with water, and rock it, all sediment being quickly removed from the smooth interior surfaces. The drum is revolved by a small auxiliary gas engine or by power take-off. A metal apron leading to the discharge chute eliminates spillage on the truck. The conveyor is air and water tight, so that when the truck is loaded and the door closed neither rain, sleet nor snow can enter to affect the prepared mixture.

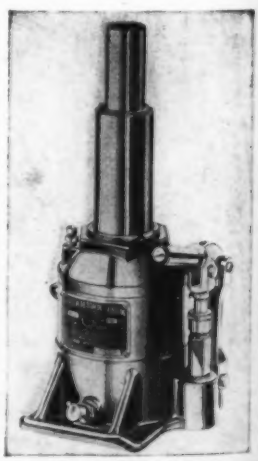
Revolving in the cone the concrete is not only churned around and around, but is at the same time thrown over on itself from back to front, the constant double agitation insuring concrete without air bubbles or segregation at delivery. On sudden stops the concrete slides toward the peak of the cone, minimizing the force of the impact at the head of the drum, with the result that both the carrier and the chassis are spared heavy sudden shocks.

Two New Hydraulic Jacks

TWO new hydraulic jacks of particular interest to contractors and road builders because they insure a minimum loss of time in changing tires, crawler tracks and for many other uses around construction equipment have recently been developed by the Blackhawk Manufacturing Co., Milwaukee, Wis.

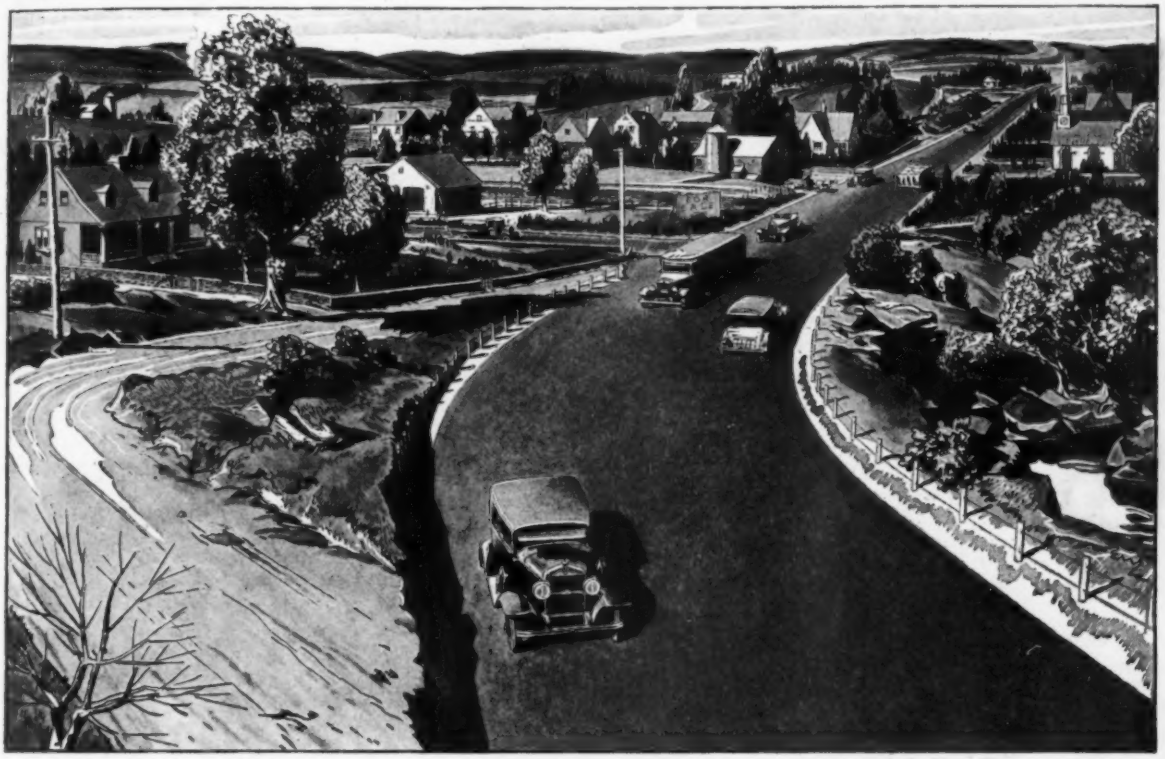
One of these models, the M7.3 is a 5-ton capacity double lift jack having a minimum height of 7 5/16 inches and a lift of 7 3/16 inches and weights approximately 26 pounds.

Model D8.7 is a 2-ton capacity jack, having a minimum height of 8¾ inches, a lift of 8 inches and a hand adjustable screw extension of 3 inches. Its weight is approximately 25 pounds. The complete line includes jacks of from 1 to 75 tons capacity.



Blackhawk Model M7.3 Double Lift Jack

No need to wait years *for this year's needs*



THIS year's needs are not a matter of pioneering new routes. Before we start blazing trails, let's *first improve what we have.*

The straightening, widening and modernizing of rambling, narrow, "buggy-gauge" roads will contribute untold relief to present conditions. Such a program is an assured means of making a little road-money do the work of a lot. When a community finally decides to meet *this year's needs this year,* it turns as a rule to the Tarvia organization for practical, money-saving cooperation.

Old gravel roads and broken down macadam can be salvaged by the Tarvia "Re-Tread" method—quickly, economically. No expensive machinery need be used to do a first-rate job, and with only the least expensive maintenance a "Re-Tread" pavement will last indefinitely—smooth, easy-riding, skid-safe and storm-proof.

Get acquainted with Tarvia "Re-Tread." 'Phone, wire or write our nearest office for full information.

The Barrett Company

New York	Chicago	Philadelphia
St. Louis	Minneapolis	Boston
Detroit	Cleveland	Birmingham
Buffalo	Columbus	Milwaukee
Providence	Syracuse	Cincinnati
Baltimore	Toledo	Rochester
Lebanon	Youngstown	Bethlehem
		Hartford

In Canada:
THE BARRETT COMPANY, Ltd.
Montreal, Toronto, Winnipeg, Vancouver

Tarvia "RE-TREAD"

TRADE MARK REG. U. S. PAT. OFF.

A 15-Yard All Manganese Steel Bucket

A Mammoth All Manganese Steel Dipper

A HUGE power shovel dipper said to be by far the most massive of its kind ever built was recently cast and assembled at the Chicago Heights plant of the American Manganese Steel Co., for the United Electric Coal Co., of Duquoin, Ill. The dipper is 14 feet high over the bail. 12 feet wide between outsides of the bail brackets and 14 feet from the ends of the dipper teeth to the bottom of the door. It weighs 37 tons empty and has a capacity of 15 cubic yards.

The usual busy statistician has figured out its weight as being about 370 times that of the two girls perched on the upper edge of the bucket and almost twice the weight of any one load of material it will handle.

This dipper is to be used on one of the largest strip mines in Illinois and is in service on one of the world's largest electric power shovels built by the Marion Steam Shovel Co. for stripping overburden from coal.

A 2,250-Yard Railroad Asphalt Plant

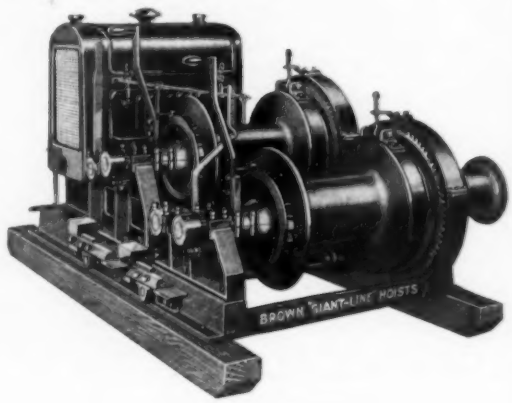
THE Merriman railroad asphalt plant which has a capacity of 2,250 yards of 2-inch top in one day's run, was first originated in 1905 and since then the plant has been manufactured by the Merriman Asphalt Plant, Inc., Lima, Ohio, and there are over 150 in operation. The plant which weighs 200,000 pounds has either an internally oil fired or coal fired dryer as desired with the well-known Merriman type dryer drum assuring maximum production and long life to the dryer itself.

The mixer is of the pug mill type with a capacity for a 1,200-pound batch or larger if desired for special use. All of the paddles are of the detachable tip type and are made of manganese steel while all of the gears are machine cut.

The boiler racks in and out, as does also the mixer platform, making it easy for the plant to be set up or packed for shipment in half a day. The kettles are heated by steam coils which prevents coking or burning the asphalt. The motive power throughout this plant is steam.

The manufacturer states that the Merriman plant is the only one-car plant that may be easily set up and taken down for shipment. When it is desired to pack the plant all that is necessary is to lower the sand bin, rack in the mixer platform, rack in the boiler, take down the stacks and it is ready to travel. All of these parts when condensed take the form of a regular freight car outline.

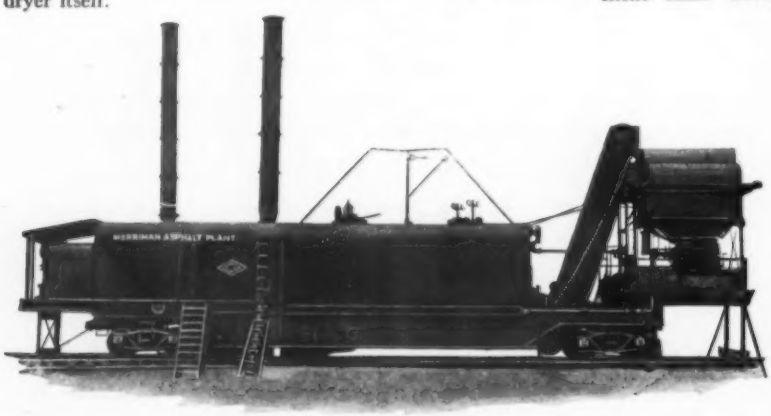
The same style of plant is also made in an 1,800-yard capacity at a lower price and as a motor-driven plant with a turbo-generator in the cab which supplies power to the motors. It sells at a slightly higher price. The Merriman Asphalt Plant, Inc., also manufacture stationary, two-unit style plants and an entirely automatic patching plant.



A New Line of Hoists

FEATURED with the new 00 series of Hercules engines in 24, 28 and 32-horsepower sizes, the Brown Clutch Co., Sandusky, Ohio, has recently announced a new Model 30-A Giant-Line hoist.

Of the same standardized design as other units ranging from 4 to 60 horsepower, the Model 30 series has incorporated in it the Brown bronze screw thrust with positive clutch release, Timken and ball thrust bearings. Alemite lubrication, Morse silent chain drive, and many other refinements developed through 25 years' specialization in the manufacture of hoists for all purposes.



The Merriman One-Car Railroad Asphalt Plant

With the advent of the road building season comes a number of unusual and interesting articles in CONTRACTORS AND ENGINEERS MONTHLY *describing a variety of road jobs throughout the country which have been visited by the Editor, all of which will contain information and suggestions of real help and interest to contractors.*

Watch for these articles in coming issues!

WELDED STEEL FABRIC, JOINTS, FORMS AND CURB BARS

FOR REINFORCING CONCRETE ROADS AND PAVEMENTS

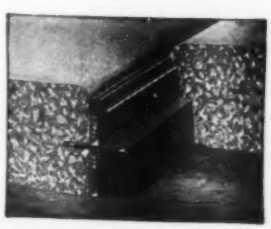
Truscon Welded Steel Fabric is an ideal reinforcement which is easily installed and stays where it is placed.
Truscon Dowel Contraction Joints provide definite planes for expansion and interlock the adjoining slabs.
Truscon Air-Cushion Expansion Joints are 100% efficient, allowing the joints to close completely when the pavement expands.
Truscon Road Forms insure rapid and accurate construction. **Truscon All-Steel Highway Guards Hot Galvanized** —give added safety and protection to dangerous portions of the road. **Truscon Curb Bars** reinforce and protect concrete curbs against shocks and abrasion.

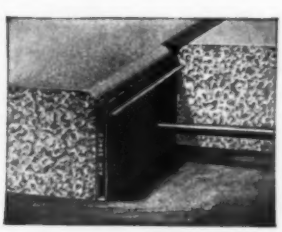
TRUSCON STEEL COMPANY YOUNGSTOWN, OHIO

Highway Division

(Warehouses and Offices in Principal Cities)

Truscon Steel Company of Canada, Limited, Walkerville, Ontario



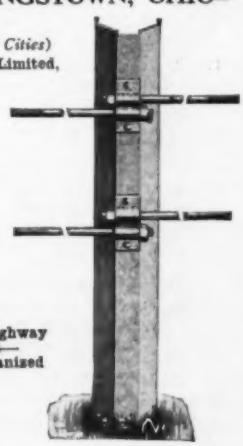


TRUSCON AIR-CUSHION EXPANSION JOINTS

Type "A" — The metallic sides are formed around a continuous dowel plate.

Type "B" — The metallic sides are straight and may be punched for the insertion of dowel bars.

PRODUCTS OF TRUSCON



All-Steel Highway Guards— Hot Galvanized

Do you mention the CONTRACTORS AND ENGINEERS MONTHLY when writing? Please do.

Hydraulically Operated Three-Way Dump Wagons

THE new three-way dump wagon made by the LaPlant-Choate Mfg. Co., Inc., Cedar Rapids, Iowa, will meet any need of the contractor for side or rear dumping equipment. It dumps to the rear, or to the right or left, being hydraulically operated with downfolding doors which open and close automatically as the body is raised or lowered. The entire dumping operation is controlled by the tractor operator from his seat on the tractor.

The body, frame and tracks are built entirely of steel and made to withstand the roughest treatment and hardest usage. Because of the quick escapment, this wagon is particularly adaptable to building roads or dams in mountainous territory where the fills have to be either side or end. The discharge opening is so large that the widest shelf rocks which can be handled by the shovels can be easily dumped. It is also recommended for use in rock quarries or places where materials are to be dumped on conveyor belts.

The New La Plant-Choate Three-Way Dump Wagon

The body is made of ¼-inch steel and the floor plate is flanged on each side 8 inches. To this flange is attached longitudinal and cross members on which the hinge castings and the lifting jack rest. The sides and bottom are ¼-inch plates and the bottom is so constructed that there is a cushion of 2-inch seasoned wood placed on top of the lower plate, this being covered with another renewable ¼-inch plate. The construction absorbs any jar resulting from the dropping of large, heavy rocks.

Light, Speedy 6-Cylinder Truck

FOR a contractor who encounters a variety of hauling conditions, the Sterling Motor Truck Co., Milwaukee, Wis., has designed the Sterling DW-13, 3 to 4-ton truck. Every moving part of the truck is heavily bushed, and snug-fitting bolts instead of rivets, strong, reinforced radius rods, high U-bolt nuts with heavy lock-washers and protected Alemite cups make for durability and long life.

The transmission provides five forward speeds and a series of gear reductions help greatly to cope with all road conditions. When low gear is used, a great pulling power is exerted and when the fifth speed is used, the truck is able to maintain a profitable speed.

The big, roomy cab is built for comfort, giving the driver maximum freedom of action, an extra long gear shift lever and emergency brake making the truck easy to operate. The steering gear and foot pedals are mounted on the woodlining of the frame, preventing road shocks from reaching the driver's arms and limbs. The tilted, clear-vision windshield, steer-easy steering wheel, and accessible controls all add to the ease of driving.

One of the Sterling Models DW13-64

This truck is equipped with a 3¾ x 4½ Red Head Ricardo engine and four-wheel hydraulic brakes. The woodlined frame and extra long and wide chrome vanadium springs make the truck ride smoothly and help reduce maintenance costs.

A New 4-Cylinder Industrial Engine

A NEW series of 4-cylinder slow speed type industrial engines has recently been announced by the Continental Motors Corp., Muskegon, Mich. These new engines, which are made in eight sizes, are of the vertical valve-in-head type, with cylinder bores ranging from 5 to 6¾ inches, a piston stroke of 6½ inches in the four smaller sizes and 7½ in the larger. The horsepower ranges from 39 in the smaller engine to 136 in the larger.

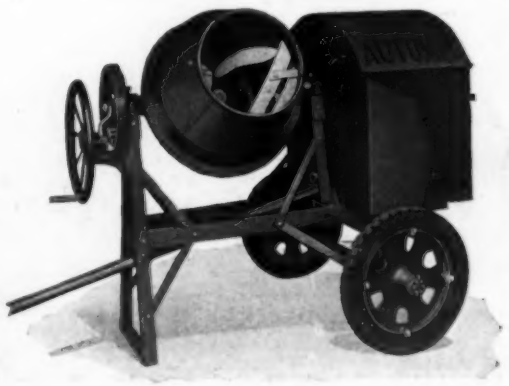
Features of this series include removable cylinder sleeves, overhead valves, crankshafts with five main bearings, dry sump oiling system, built-in governor and longer pistons, all of which tend to increase the life of the motor and permit more working hours at a minimum cost.

A New Light Tilting Mixer

IN designing the new Gilson Automix tilting mixer, speed in moving, speed in mixing a thorough batch and continuous trouble-free performance necessary to meet the contractors' requirements were given first consideration by Gilson Bros. Co., Fredonia, Wis.

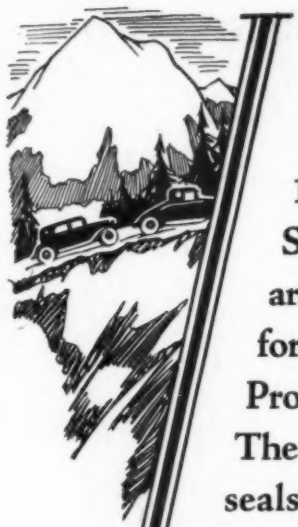
An adjustable locking arm holds the drum at any angle and a ratchet lock holds it in position on the discharging side, the drum tilting in the same direction in which the hand wheel is turned. The counterbalanced drum returns from the discharging position and automatically locks in charging position.

The frame is made of heavy 3-inch channels and 2 x 2 angles, well braced and hot riveted. Trailers are furnished with 24 x 3-inch all-steel or 24 x 3½-inch disc cushion tire

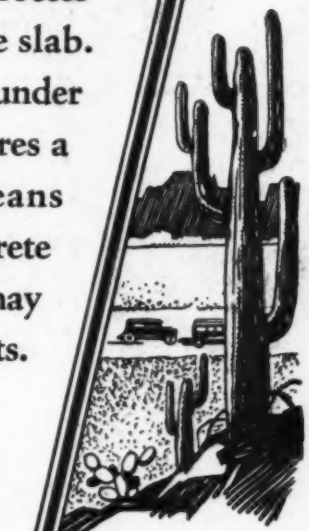


The Gilson Automix

Uniform Dependable Curing with the "Hunt Process" *wherever Concrete is placed*



FROM Jones Beach on the Atlantic to Del Rey on the Pacific; from below sea level to 10,200 feet above; from Northern Minnesota to Southern Arizona, "Hunt Process"-cured jobs are delivering the utmost in pavement performance. Concrete pavements plus "Hunt Process" are indifferent to climatic conditions. The airproof, waterproof film of "Hunt Process" seals the original mixing water into the slab. Hardening of the concrete then proceeds under ideal conditions. "Hunt Process" assures a uniform cure. And uniform curing means uniform strengths . . . the aim of all concrete control methods. No matter where the job may be, "Hunt Process" meets all the requirements.



The "why" of it is explained in an interesting booklet on concrete curing. The coupon below will bring it.

McEVERLAST, INC.
[LIMITED]

111 West Seventh Street, Los Angeles, California

35 East Wacker Drive, CHICAGO, ILL. | 1754 Graybar Bldg., NEW YORK, N. Y. | 1314 Magnolia Bldg., DALLAS, TEXAS

OFFICES IN PRINCIPAL CITIES

I want further information on this better method of curing.

Name.....

Address.....

City.....State.....

C.&E. 5-30

wheels, roller bearings being standard equipment on both steel or cushion tired wheels. The spring mounted axle provides an additional cushion for traveling at high speed over rough roads.

The sturdy all-steel engine house is roomy and well made of heavy sheet steel. There are four mixing blades, the construction being such that the mixture goes through four mixing actions to every revolution of the drum, thoroughly mixing the finer and coarser aggregates and producing an evenly mixed batch in less than one minute.

Heavy Duty Cutting Equipment

PORTABLE sawing equipment for cross-cutting and dadoing 12 x 12 and 12 x 20 timber right on the job has been developed by the DeWalt Products Corp., Lancaster, Pa. Instead of a two-man saw for cutting heavy timber, this job may now be handled by one man feeding the material through the DeWalt heavy-duty saw with a hand ratchet gear feed or by chain feed on the arm of the machine. This arm may be raised or lowered to the depth of the cut, and saw blades up to 36-inch are provided to handle 12 x 20 material, or a 16-inch dado head may be used to dado up to 3 inches. The saw blade operates at 1,750 rpm, and is direct-driven by a

The DeWalt Model L Saw for Cutting Heavy Timber

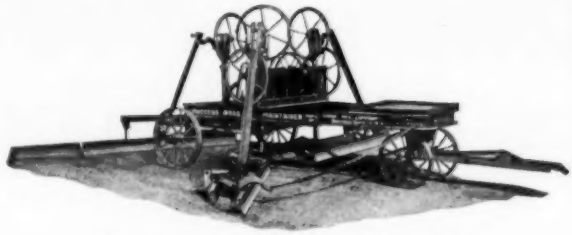
motor operating on either 2 or 3-phase current in 220 to 550 volts.

Two models may be secured in this heavy cutting equipment, Models L and T, the capacity of Model L being 12 x 12-inch material, and Model T, 12 x 20. The Model T is mounted on an all-metal table, equipped with all-steel conveyor rollers for easy handling of heavy material. The elevating device is operated by a wheel in front of the table, which gives rapid elevation and ease in operation.

An Adjustable Road Maintainer

WHILE not of great weight, the Success road maintainer, made by the Shunk Mfg. Co., P. O. Box 37, Bucyrus, Ohio, is sturdily built for heavy-duty maintenance work. Its frame of 6-inch channel steel is thoroughly braced and riveted, and the entire weight of the machine can be placed on the Twin-Dual blades, resulting in lack of vibration and allowing the blades to shear and plane the surface smoothly. A 15-30-horsepower tractor affords ample power for operation.

Each set of dual blades is separately controlled by three large hand wheels, easily operated, to raise or lower the heel or toe or to draw them into the machine to a neutral position.



The Success Twin-Dual Road Maintainer

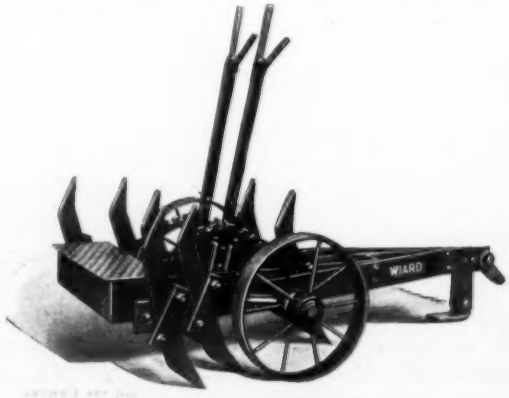
The rear blade is also raised or lowered with its own hand wheel. Two additional adjustments offer varied positions for this blade, the large and roomy platform giving the operator access to all adjustments. All five blades are double-edged, extra wide, high-carbon steel, reversible and interchangeable to all positions.

This maintainer is adjustable to any width of road, so that a 36-foot road can be worked in one round trip without disturbing traffic, and narrow roads can be worked in one trip. Shoulders or berms can be built and maintained without leaving the road proper. The front blade of the maintainer works the material across the road, filling up the low spots and cutting off the high spots in the hard surface beneath, and the second or float blade follows over the same surface and works the excess material over it a second time, giving an even, smooth surface.

A Gang Rooter and Scarifier

ONE of the tools essential for a road contractor is a gang rooter or scarifier such as the Wiard Grade-Ripper made by the Wiard Plow Co., Batavia, N. Y. This tool works behind any tractor, the amount of power required depending entirely upon the work involved and the material. On light scarifying operations, the small tractor is sufficient. When drawn by a large tractor, road roller or other high-powered motor, this unit will rip gravel and macadam roads.

The Grade-Ripper weighs 1,425 pounds. The frames are made from open hearth steel with all of the rivets driven hot. The teeth are made from special high carbon steel and the wheels are steel with heavy wide bearings of composition bearing metal with a special grease reservoir, an Alemite greasing system and protection of the bearings from dust. The ripper handles a 4-foot strip and is operated by one man who can see the work that the ripper is doing at all times. The teeth are adjustable so that they can work at any depth up to 12 inches. These teeth or points are double ended and may be sharpened or drawn. The control of the teeth is entirely by two hand levers which work independently of each other.



A Gang Rooter and Scarifier

Omaha Airport . . . solves its drainage problem *this way* . .

Laying GOHI Corrugated Culverts at Omaha's modern airport.

GENUINE OPEN HEARTH IRON — GOHI — TRADE MARK — PURE IRON – COPPER ALLOY — REG. U.S. PAT. OFF.

(Meet copper-bearing pure iron requirements in all accepted specifications for corrugated metal culverts.)

Corrugated Culverts

THE progressive city of Omaha is draining its modern sixty-acre airport with GOHI Corrugated Culverts. It has selected this modern culvert for its proved permanence — its rapid, low-cost installation—its strength which withstands the impact of heaviest planes — its flexibility which prevents breakage under the terrific pressure of freezing water or settling earth fills.

Made of Genuine Open Hearth Iron — pure Iron-Copper alloy — these culverts offer maximum resistance to corrosion and give lowest-cost-per-year service of any culvert material. Get ALL the facts and you'll specify GOHI Corrugated Culverts.

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Have Stood the Test of Time

GOHI Corrugated Culverts that have been in service for twenty years have been found, upon examination, to be practically perfect and good for undetermined years of additional service.

GOHI CULVERT MANUFACTURERS, Inc., Newport, Ky.

Central Culvert Co.
Ottumwa, Iowa

Denver Steel & Iron Works Co.
Denver, Colo.

A. N. Eaton, Metal Products
Omaha, Nebr.

Feenaughty Machinery Co.
Portland, Oregon

Lincoln Steel and Forge Co.
St. Louis, Mo.

The Newport Culvert Co.
Newport, Ky.

The Pennsylvania Culvert Co.
Philadelphia, Pa.

Roanoke Sales Corp.
Roanoke, Va.

St. Paul Corrugating Co.
St. Paul, Minn.

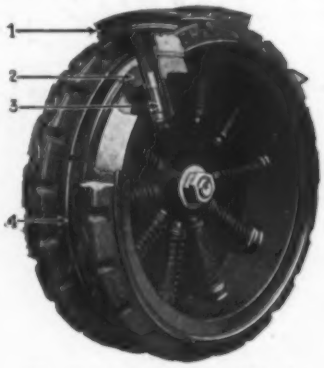
Tennison Brothers
Oklahoma City, Okla.

Tennison Brothers
Texarkana, Ark.

Capital City Culvert Co.
Madison, Wis.

A Solid Rubber Tire With Cleats

ONE of the newest developments in dual wheels for road graders has been brought out by the Wehr Co., Milwaukee, Wis., in the Wehr all-purpose wheel. This wheel is in reality a dual wheel with solid rubber tires between which are 10 cleats held snugly down between the tires by coiled springs. The steel cleats are one piece, with a 2-inch pentagon shank through a pentagon hole in the wheel rim. There are only three pieces, cleat, spring and cap. Thus, when the grader is running over a hard-surfaced road, the cleats remain snugly fitting between the tires out of the way and below the surface of the tires. When the grader pulls off the hard-surfaced road, and is to be operated in soft ground, mud, snow or wherever traction is difficult, the operator pulls up the cleats with a simple special lever, furnished for that purpose, and turns them so that they rest across the two tires and provide ten grousers on each dual wheel.

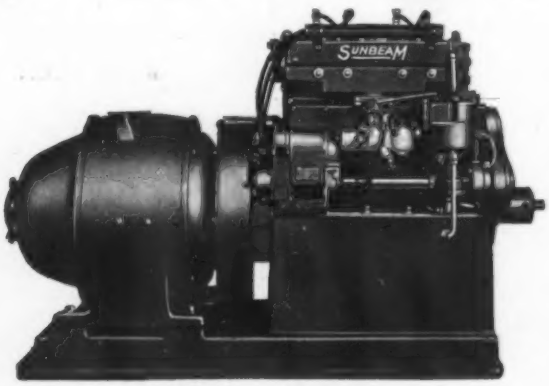


The Wehr All-Purpose Wheel

A Small Self-Contained Electric Plant

THE light, compact and completely self-contained design of the Sunbeam gas-electric plant made by the Sunbeam Electric Mfg. Co., Evansville, Ind., makes it practical for such uses as the lighting of construction jobs where night work is being carried on, lighting construction camps, and operating electric saws, air compressors, drills, riveters, draglines and other construction equipment. They are made in 1½, 2½, 4 and 5-kilowatt sizes, and are built for rough service, the general design being such as to give a well-balanced weight distribution over the entire subbase, insuring smooth performance. There is no overhanging weight to set up vibration.

The engine has four cylinders of 2½-inch bore by 3 1/3-inch stroke, the crankshaft being 1¾ inches in diameter. The standard plant is equipped with radiator and fan, circulation of the water being accomplished by the thermo-siphon system. The radiator is of tubular core construction, will not clog and gives ample cooling capacity even in very hot climates. The marine type plant is equipped with a circulating water pump.



A Sunbeam Gas-Electric Plant

This plant will produce practically uniform voltage output under all load conditions. Besides the positive acting governor on the engine, the generators are especially wound, so as to produce uniform voltage at all times. The generator is of the interpole type assuring sparkless commutation under all conditions.

All Sunbeam gas-electric plants are completely equipped for operation when shipped, equipment including high-tension magneto, with impulse coupling, governor, spark plugs and wires, starting crank, carburetor and all items for satisfactory operation. The fuel tank is located in the subbase and the engine is equipped with a high-grade vacuum tank.

A Small Trailer Mixer

AS small mixers are moved more frequently than large machines, the questions of strength and rigidity was carefully considered in designing the 3½-foot Republic trailer mixers, which are made by the Republic Iron Works, Tecumseh, Mich. They are equipped with spring shock absorbers and have roller bearing construction throughout, as well as steel roller drive chain and heavy demountable tires.

A 3½-Foot Trailer Type Tilting Mixer

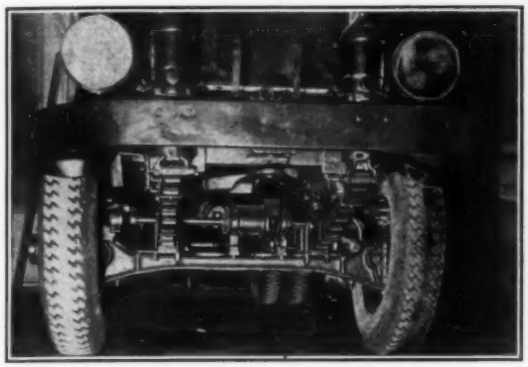
The wheels are of the disc type on which are mounted Goodyear 24 x 3½-inch cushion type tires, the hubs of the wheels being equipped with Hyatt roller bearings with case-hardened steel races which take the wear, avoiding worn and wobbly wheels.

There are two Hyatt roller bearings on the mixing drum shaft and two on the drum drive shaft, all equipped with split steel races. Between the drum and yoke is located a ball thrust bearing, also supplied with steel races and protected by a dirt collar.

The counterbalanced drum is a feature which permits of easier and more rapid operation, but little effort being required to start the drum to swing it to the opposite side for discharging. The standard engine will develop 2 or more horsepower and is enclosed to keep out the cement, dirt and grit. Any make of engine can be furnished on special order.

As cleaning is an important item in any mixer, particular attention was given to the design of the mixing drum and blades to avoid pockets. The drum bowl is rounded and the mixing blades raised from the shell, which permits a scouring action of the material as it flows around the drum. This assists in keeping the mixer clean. The blades not only elevate and shower the material, but plow through it, giving a fast mix.

FREEMAN
4 wheel drive TRUCKS



The FREEMAN with Its New Type Bevel Gear Driving Axle Steers as Easy as a Pleasure Car

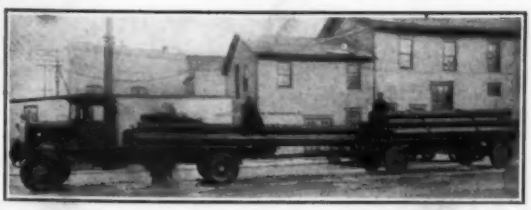
PREVIOUS types of Four-Wheel Drive Trucks had the advantages of additional traction, overbalanced by disadvantages in steering, due to the use of a universal joint steering axle. This type of axle always steers hard when power is applied, because of friction developed by the angularity of the point.

To meet all requirements and yet remove this disadvantage, FREEMAN, after years of careful engineering, has developed a new type of four-wheel drive, front-wheel-steer truck, which finds its highest perfection in these new FREEMAN models. All the disadvantages of universal joint design have been successfully removed with a bevel design front-steer drive, running in oil, in weather-proof housings.

The FREEMAN Four-Wheel Drive has easy steering, as easy as a pleasure car. A child can turn the wheels. Yet there is high power, giving the owner a high-speed express truck, which through its range of eight forward speeds can adapt itself to the paved streets of city or village as well as the farm, oil, lumber, road-building or general contracting fields.

Write for our illustrated folders

FREEMAN MOTOR COMPANY
DETROIT U. S. A. MICHIGAN



WHAT YOU WANT IN A TRUCK YOU'LL FIND IN A FREEMAN

DRAINAGE on jobs that pay a profit

There is just one reason for investing your good money in Barnes Drainage Pumps—to help you make more jobs pay you a decent profit.

Eliminate delays caused by pumping equipment that lays down on the job, and you have just that much more chance of finishing the job on time, with profits in your pocket. That's the job for a Barnes.

Use the coupon and get the facts about the type of pump that fits your job. Barnes makes it.

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MANSFIELD, OHIO

BARNES DRAINAGE PUMPS

Barnes Manufacturing Co.,
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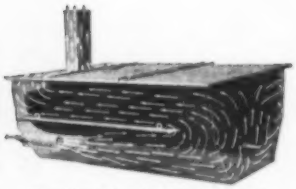
A Tar and Asphalt Kettle of New Design



Double Circulation Feature

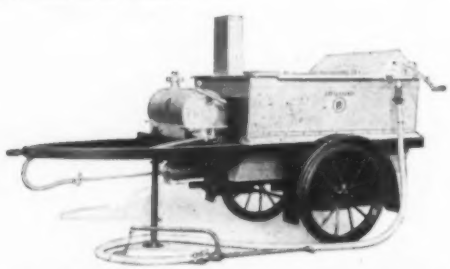
A TAR and asphalt kettle, No. 84-HD, entirely new in design, has been announced by Littleford Bros., 485 East Pearl St., Cincinnati, Ohio, with the claim that asphalt can be drawn from the melting tank almost immediately after starting the oil burner.

The double heat circulation from the burner to the rear of the kettle and then up and back to the vent stack is clearly shown in first illustration. The baffles, D, running between the melting tank and the furnace shell hold the heat down in the lower part of the heating chamber until it reaches the rear of the kettle. Then the heat is drawn by draft to the front of the kettle and the gases pass out through the vent stack E. There is no blast of heat in one spot, the intense heat being distributed over the entire kettle and every degree being used to the limit before it reaches the vent stack. This even distribution of heat results in immediate melting of the asphalt with all danger of over heating or coking the material eliminated.

Cross Section Showing Triangular Screen

The triangular shaped screen, A, which extends the full length of the melting tank, divides the tank into two reservoirs, B for the cold material, and C for the hot melted material, as shown in the second illustration. The triangular shape of this screen forces the cold material against the sides of the melting tank, thereby getting the full effect of the evenly distributed heat caused by the double heat circulation. The material melts immediately and passes down the sides of the kettle as well as through the holes in the screen into the reservoir, C. Cold asphalt can be added in any quantity at any time without chilling the hot melted material. This is a distinct advantage in both maintenance and contracting work in saving time in getting the job started.

The kettle is made in 110, 165 and 210-gallon sizes and can be loaded to its full rated capacity. It is mounted on a chassis of unusual strength and trailing quality which is cushioned on semi-elliptical springs. The center of gravity of the kettle is lowered and road shock is greatly reduced. Timken roller bearings in the rubber-tired wheels mean that a trailing speed of 20 to 30 miles an hour can be maintained mile after mile with no harm to the outfit.



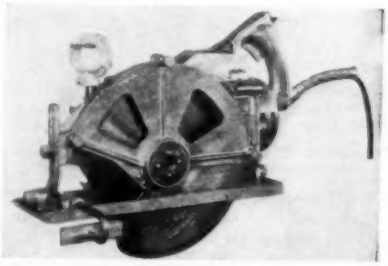
No. 84-HD Maintenance Kettle Equipped with Littleford Hand Spray Attachment for Penetration Work, Skin Patching and Crack Filling

Two New Portable Electric Saws

TWO new portable electric saws made in 10 and 12-inch sizes, have recently been announced by the Speedway Manufacturing Co., 1834 South 52nd St., Cicero, Ill. The 10-inch saw carries a ¾-horsepower General Electric motor and runs at a no load speed of 1,800 rpm. The 12-inch saw is powered by a full horsepower General Electric motor and travels at a speed of 1,750 rpm. Both of these saws run on either alternating or direct current.

Among the features of these saws are a slipper plate base which can be raised and lowered for adjustment of the depth of the cut, a swinging saw guard which automatically pushes back out of the way when cutting pressure is applied and which returns to guarding position the moment pressure is released, and a cast aluminum saw guard covering the upper part of the saw blade. The side cover of this guard is quickly and easily removed for changing blades by loosening three knurled hand screws. The entire saw guard is so designed that it will not collect saw dust.

The machine is fitted with ball bearings throughout and all gears and shafts are made from heat treated chrome nickel steel. Gears and bearings are packed in grease. The saw blades are mounted on the left side of the machine to give maximum visibility to the operator. These blades are driven through a carefully designed driving flange which drives positively and without the necessity of clamping the blade tighter with a spindle nut than is sufficient to hold it in place. On both models a ripping guide is mounted on the front of the slipper plate to facilitate long cuts.



The Speedway 10-Inch Portable Electric Saw

Both models are equipped with the D-type handle which is adjustable to either of two positions. The 10-inch saw weighs 25 pounds and the 12-inch model 28 pounds.

A Standard 28-S Mixer

THE Ransome 28-S standard building mixer, the latest model of which is described in Bulletin 124 recently issued by the Ransome Concrete Machinery Co., Dunellen, N. J., has been installed on many of the large construction jobs and in many of the leading central mixing plants. The main frame of the mixer is of unusually rigid construction and is strongly gusseted and hot riveted. The main members are two 9-inch I-beams which support the drum and two 9-inch channels for supporting the overhead frame, together with the mechanism which is bolted to it. The drum rollers are of genuine car wheel metal, chilled faced and flanged and are ground to exact size. The diameter and face are unusually large with long hubs and the Timken roller bearings are protected by dust caps.

The mixer drum is of all-steel construction with large radius corners. The drum tracks are of solid high carbon steel machined to exact diameter. The mixing blades are equipped with high carbon steel renewable liners. The drive from the motor or engine to the countershafts is through one set of cut gears running in an oil bath to exclude all dust and grit. The countershaft is of high carbon steel running in heavy duty Hyatt roller bearings with solid inner and outer hardened steel races.

The new Champions—
"the *most powerful diggers* built!"

THE first thing you hear from a user of the new WILLIAMS "Champion" is that *the Digging Power and Speed of this new bucket are beyond anything seen before.*

It's a real champion, that welcomes competition. Put on your job with the guarantee to outdig and outspeed any other bucket.

It will pay you to investigate the 21 improvements that have given the new "Champion" new power and speed. Write for Bulletin "25-J."

G. H. WILLIAMS COMPANY
609 Haybarger Lane, Erie, Pa.
Branch Offices: New York, Pittsburgh, Chicago

WILLIAMS
FAST-DIGGING BUCKETS

165

DIFFICULT? Yes, but a WARCO Does It!

WARCO One-Man "Road-Hog" power graders are engineered—not just assembled.

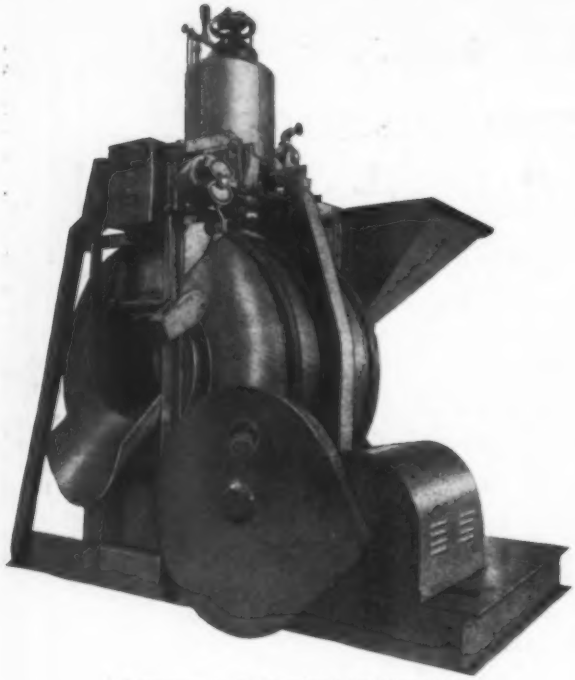
They are expected to do construction work, in keeping with their size, (and you have three sizes for selection) as well as high class, fast maintenance.

WARCO oscillating rear-type crawlers hitch the power of your tractor to the ground. WARCO head-type steering, and three point motor suspension make such jobs as this possible.

Three sizes—six models—center and rear control power graders.

You owe it to yourself to thoroughly investigate WARCO graders, wheeled scoops and rear-type crawlers before you buy.

W. A. RIDDELL COMPANY, BUCYRUS, OHIO
Power and Drawn Graders — Wheeled Scoops — Rear Type Crawlers for Tractors



A Ransome 28-S Standard Building Mixer

The discharge chute, semi-circular in shape, swings in and out of the drum while the lower chute is in a fixed position. The upper swinging chute reaches far into the drum when discharging and swings completely out of the path of the falling concrete when mixing. An entire batch can be discharged in from 8 to 10 seconds.

The Ransome spiral cut off water tank which is the result of some years of study and also of actual experiment, gives complete accuracy for any one setting, batch after batch and has showed no variation when carefully checked by a hook gage. One turn of the control wheel changes from the maximum to the minimum which can be discharged from the tank.

The batch hopper is of ample capacity and is equipped with a sliding steel gate operated by a single lever. The gate is provided with non-clogging slides. The large opening and the steel slopes on the batch hopper allow the material to get into the drum clean and fast.

A New Bearing Metal for Construction Equipment

COST equipment used by contractors, especially in the field, is subjected not only to the severe service to be expected in this line of endeavor but is also subjected to atmospheric conditions not conducive to satisfactory bearing performance. Such treatment of bearings ordinarily results in scored shafts if not in seized bearings. The latter results in the mechanism involved being out of commission until a new bearing replacement can be made, whereas a scored pin or shaft results in interference with rotation to such an extent as to make a shutdown advisable, if not necessary.

Bearium, a new bearing metal marketed by the Universal Bearing Metals Corp., 258 State St., Rochester, N. Y., has the property of being able to function as a bearing regardless of operating conditions without injury to the shaft, thus definitely avoiding taking a piece of equipment out of service during working hours. Bearium does wear, but the rate of wear is noticeably less, because of its low coefficient of friction and high tensile strength. What is of particular interest to the contractor is that when a Bearium bearing has worn to an extent requiring replacement, it is only necessary to slip a new bearing in place, the usual expense and time lost in changing a shaft as well as a bearing being avoided.

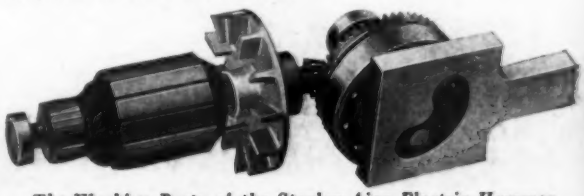
Another point of interest to contractors whose equipment is subjected to varying weather conditions is that the performance of Bearium is not so dependent upon the condition of the lubricant as is the case with other bronzes. A lubricant that will take care of a bearing in warm, dry weather, is frequently not suited for wet or cold weather in an exposed position. Such changes in atmospheric condition do not result in shut down and repairs when Bearium is employed, owing to its ability to function as a bearing with water in the lubricant or with the lubricant entirely withdrawn.

Portable Electric Hammers

THERE are so many classes of work faced by a contractor where a rather light hammer or drill is necessary that many are equipping with Stanley-Ajax electric hammers which are useful in drilling holes in concrete, brick or stone for expansion shields, drilling through walls, floors and foundations, chipping for electric fixtures, pipes and joists, chiseling steel or wood, riveting and vibrating castings and forms.

The mechanism of the Stanley-Ajax electric hammers made by the Stanley Electric Tool Co., New Britain, Conn., is simple. A powerful Universal motor, specially constructed for hammer service drives a crank through heat treated alloy steel beveled gears. Extending from the face of the crank is a hardened steel pin and roller which operates in a curved slot cut in the face of the plunger or reciprocating member which is guided to move only in one plane. Due to the action of the roller in the curved slot, the plunger is driven downward at great speed. When maximum velocity is attained, the plunger is automatically released permitting a powerful blow to be developed without the transmission of shock to the mechanism. These hammers are constructed of the finest materials and are ball-bearing equipped throughout. All parts of the mechanism are made from special alloy steel, heat treated for maximum durability. The No. 310 electric hammer will drill a 1⅛-inch hole in concrete, operates on 2.3 amperes, at 100, 250, 220 or 250 volts and delivers 2,400 blows per minute. It uses an AC or DC Universal type motor operating on 60 cycles or less from a light socket. The length of the hammer is 16¼ inches and its net weight 10 pounds. The No. 320 electric hammer is slightly larger throughout and weighs 22 pounds, drilling a 2-inch hole in concrete. The lighter hammer is particularly suitable for working overhead without the use of scaffolding or hammer support and it can be used for drilling very close to sidewalls or other obstructions.

The Stanley-Ajax Hammer Drilling in a Brick Wall



The Working Parts of the Stanley-Ajax Electric Hammer

Dump Truck Men Choose Wood

Excavating demands equipment with unusual strength and stamina. Here you see Wood Hoists and Bodies on the job.

WOOD welcomes the Dump truck user who buys on a dollar-and-cents basis — who demands proof to check the important features of design, construction and operation. Dump truck men who demand efficiency and economy favor Wood Hoists and All-Steel Dump Bodies. They *know* that Wood dumping equipment is ruggedly built for severe service — enabling them to haul and dump loads for profit.

As pioneers in serving dump truck users, we have developed hoists and steel dump bodies which, today, stand out as engineering achievements. Permanent value is better than a temporary bargain. That's the reason Wood Dumping Equipment is the choice of dump truck men *who know*.

• Write for Bulletin 200.

SERVICE EVERYWHERE

WOOD HYDRAULIC HOIST & BODY CO.
DETROIT, MICHIGAN

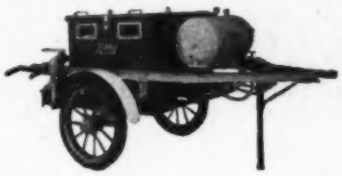
WOOD HOISTS & BODIES

BRANCHES AND DISTRIBUTORS IN PRINCIPAL CITIES

Hotstuf
TRADE MARK REG.

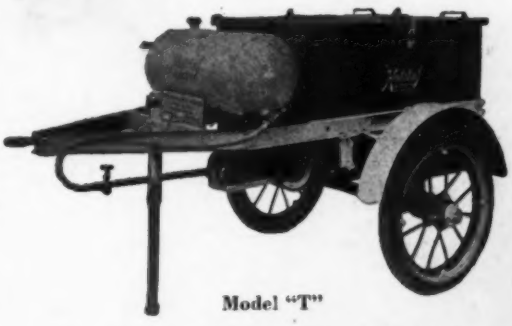
Save at least $1.20 per day...per man...

Figuring your labor cost at $4.00 per day per man, HOTSTUF with its 30% greater melting capacity will save you at least $1.20 per day per man. On top of this you can add a fuel saving of 30%. Multiply this saving by the number of men in your crew and then by the number of working days per season and you will quickly appreciate the true worth and value of HOTSTUF Heaters.



Model "C" is the Combination Tool and Asphalt Heater. Produces hot tools and hot asphalt in five minutes from a cold start. Heats 16 or more tools at once. Holds 50 gallons of asphalt and melts 5,000 pounds in 8 hours.

The MOHAWK HI-SPEED TRAILER TOOL BOX is an all steel box especially designed for the many uses of the progressive contractor. Made of heavy sheet steel. All seams electrically welded. Double covers which are waterproof and can be locked down. Made in 6, 7 and 8 foot lengths. It combines speed, security, strength and rugged construction.



Model "T"

Write now for Catalog No. 12. It describes in detail HOTSTUF Heaters and Trailers.

MOHAWK ASPHALT HEATER CO.
60 Weaver St., Schenectady, N. Y.

A Nordberg-Butler Shovel

A Small Shovel for Working in Restricted Places

DESIGNED primarily for working in narrow and restricted places to replace slow and expensive hand shoveling of broken and blasted material, the Nordberg-Butler shovel Model No. 110, made by the Nordberg Mfg. Co., Milwaukee, Wis., will work in a minimum drift of 5½ feet in width by 7 feet in height and at the same time will clean up a path 18 feet in width in wide tunnels or stopes. The shovel has the ability to dig 8 inches below the top of the rail on which it is working either straight ahead or to one side.

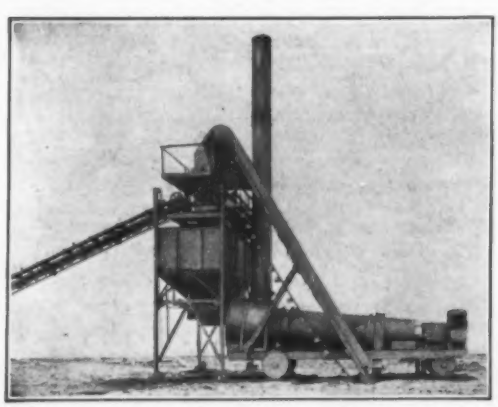
It has a capacity of 30 to 35 tons per hour of uninterrupted loading and is very economical on power, requiring but 150 to 165 cubic feet of free air per minute at 80 to 85 pounds pressure. It is very simple to operate. The main valve lever is pushed in the direction in which the dipper is to move and the revolving motor lever is pushed in the direction in which the shovel is to rotate.

The standard shovel will load into cars up to 56 inches in height above the top of the rail, and will distribute the load into cars 9 feet long.

Pre-Mixed Material for Oil Road Construction

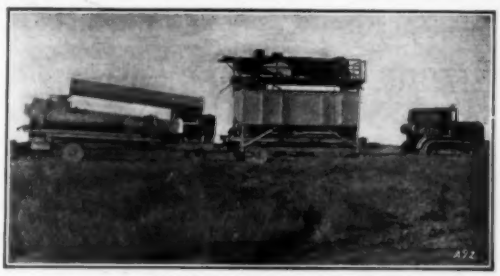
A COMPLETE plant, known as the Cedar Rapids pre-mix plant, for producing a properly mixed low-cost bituminous road surfacing material, has been developed by the Iowa Manufacturing Co., Cedar Rapids, Iowa. It is stated that with this plant oiled gravel can be produced at one-fourth to one-sixth of the mileage cost of high type hard-surfaced material.

The Cedar Rapids pre-mix plant consists of two units, the drier unit for drying the raw material and heating both gravel and road oil to the specified temperature and the bin and pug mill unit for storing raw gravel, mixing dried gravel and heated oil and finally storing the pre-mixed material. The drier unit consists of a drier drum, oil burner, road oil pump, power plant and folding stack all mounted on a heavy steel truck for ready portability.



A Complete Plant for Producing Bituminous Road Surfacing Material

Connected with the drier unit by a bucket elevator driven from the pug mill is the bin and pug mill unit. This unit consists of the pug mill, aggregate and road oil batchers and two compartment bins, one compartment for untreated material and the other for the finished Pre-Mix. Each compartment is of 17 cubic yards capacity. These, together with the 30-horsepower Hercules motor, are carried on their own I-beam channel steel trucks. Steel walkways and stairways with railings provide ready access to the top of the plant. When knocked down, ready for transportation, both units measure slightly over 12 feet high. The entire plant can be knocked down in one working day and set up in another. A tank car heater, a 1,000-gallon truck tank for carrying oil to the plant and a special unit for pumping the road oil from the tank car to the truck tank are necessary accessories provided to be used in connection with the regular equipment of the Cedar Rapids Pre-Mix plant.



The Plant Dismantled and Ready for Transportation

Diesel Handles Excavation at Low Cost

AN interesting example of economical power and the use of a diesel engine in movable operations is furnished by the Inter-County River Improvements of Tacoma in the dredging work on the Stuck River in Washington.

This Improvement conducts joint operations in dredging and building levees on rivers dividing King and Pierce Counties, Washington, the Boards of County Commissioners of the two counties serving as the Board of Control, with Chief Engineer H. F. Gronen in actual charge of operations. The work consists of removing very large gravel from the channel of the Stuck River, pulling it to the bank and building it up to form a levee. Since the outfit works along the soft banks of the river and must be moved every 2 or 3 hours, light weight without sacrifice of available power was essential in selecting the power unit.

The Board purchased a 120-horsepower Buda M.A.N. diesel engine, made by the Buda Co., Harvey, Ill., mounted on a steel frame with, and driving, a double drum two-speed hoist. This machine operates a 3-yard heavy duty dragline bucket. It was placed in operation November 1, 1929, and has been operating since that time.

In commenting on these operations, the Chief Engineer gives the following details: "The average haul is about 500 feet, the last 100 feet being pulled up on about a 3 or 4 to 1 slope. The machine has been handling the bucket at a speed of 325 feet per minute in high gear without difficulty. Fuel consumption per day is approximately 40 gallons of diesel oil at 4 cents per gallon. The total cost per day, including fuel and lubricating oils, labor, wire rope and upkeep, amounts to about $24. The yardage handled averages between 500 and 600 cubic yards per day or an average cost of less than 5 cents per cubic yard.